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NEW MEDICATIONS.

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With Appendices and Illustrations.

1886.
GEORGE S. DAVIS,
DETROIT, MICH.

[redacted]

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* The heading of this chapter is wrongly given in the text.

TRANSLATOR'S PREFACE.

Dujardin-Beaumetz is now so well known in this country that any production of his will be welcomed by progressive American physicians.

Editor of a leading therapeutic journal (the *Bulletin Général de Thérapeutique*), physician-in-chief to the great hospital Cochin, where over a thousand patients are constantly under his general supervision,and where a spacious amphitheatre has been erected for his use in clinical teaching, also a fine laboratory for clinical and physiological investigation, the author of this work by his pen and by his oral instruction is the centre of a wide influence, inspiring a host of ardent workers to alacrity, diligence and thoroughness in promoting the cause of scientific and practical medicine.

Of his numerous publications, only three of any considerable magnitude have been translated into English: the present volume, the work entitled Clinical Therapeutics published last year by G. S. Davis of Detroit, and Diseases of the Stomach and Intestines, which has been issued the present year by the well known firm of Wm. Wood & Co., 56 and 58 Lafayette Place, New York. The latter is a part of the Medical Library Series for 1886.* Whether the Clinical Therapeutics series, of which the second, and in some respects the most important volume, still remains untranslated, shall ever be completed so as to be available to American readers who are unfamiliar with the French, is uncertain, though probable.

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* This work, which forms a complete volume of 400 pages, is one in which our author appears at his best; it is everywhere rich in practical suggestions and "abreast of the times," and I cannot too highly commend it to the readers of New Medications.

vi.

The term, New Medications, which has been chosen as the title of this book is suggestive of the necessary implication that there are old medications, some very old, and which have been in vogue ever since the human race first emerged from a state of utter barbarism, and learned to treat the sick by rational methods, rather than to leave them to the mischievous meddling of the wizard, the sorcerer, or the savage medicine man.

It cannot be asserted that the fathers of medicine were fools, or that the old medications which were the result of sound experience and observation, and have in past years been the basis of rational practice, are to be superseded by any new methods, except so far as the new better fulfil the indications, are more completely adapted to respond to enlightened views as to pathogeny, or furnish a more complete equipment to the physician. That some of the modern methods do meet these conditions and thus assert their right to pre-eminence, no careful reader can deny. The pathology of past ages furnished to the practitioner of medicine the same momentous problems for solution, and the same urgent indications; on the one hand, owing to the tardy progress of science, the data were lacking for a complete knowledge of the morbid conditions, and chemistry and pharmacology on the other hand, had not yet given to the profession their powerful auxiliary resources. Hence there was room for the therapeutic advances which the nineteenth century has realized.

To illustrate my meaning: bromide of potassium is one of the new medicaments, and no one will dispute that a great advance has been made in the treatment of the convulsive neuroses, and especially epilepsy, since this new remedy was introduced into therapeutics, fulfiling, as it does, certain indications better than any of the old remedies. But this is not all: this therapeutic gain is concomitant with a much more precise knowledge of these convulsive disorders than our predecessors possessed, as will be seen by comparing with our present treatises any standard medical work (such as Cullin's Practice of Physick) published a hundred years ago.

But it is unquestionably true that some of the "old medications" were bad, and the enlightened physician of to-day has discarded them for modes of treatment more rational and scientific. Among these *bad* medications I do not hesitate to class blood-letting (which has almost passed into oblivion), and the antiphlogistic treatment generally of acute inflammatory diseases. Here the utility of a new medication—the tonic and supporting treatment of acute inflammations and fevers has been strikingly manifested.

Many of the medicaments on which physicians most rely are "old as the hills," and will probably hold their place in the Materia Medica as long as sickness continues on this planet. As a pure analgesic it is probable that opium will never be surpassed or superseded. Iodide of potassium and mercury will probably remain the best specifics with which to combat the accidents of syphilis. Quinine (which is simply a handy form of an old remedy, cinchona bark) will still be the anti-malarial specific *par excellence*. Rhubarb, ipecac, senna, squills, and even castor oil will still continue to meet certain indications, and will not be crowded out of the pharmacopœia. But there will be a gradual weeding of the Materia Medica; many really useless medicines will be dropped, and less medicine will be given in the future; alimentation, hydrotherapy, etc., are to have a predominance—in fact the hygienic treatment of disease is destined to come to the front.

Of the "new medications," some have doubtless come to stay. Sparteine and convallaria may be abandoned, but cocaine is a permanent acquisition to therapeutics. We may doubt the remedial value of grindelia robusta, but the pneumatic cabinet will remain a part of the armamentarium of the specialist in lung diseases. Stomach washing (lavage) so exactly meets, therapeutically, certain pathological conditions that it must continue to hold a place in the treatment of stomachal diseases. Certain of the new antipyretics mentioned in these pages will doubtless prove to be of great utility in the future.

But progress in medicine is destined to be largely in the direction of what our author calls *etiological therapeutics*, *i. e.*, in a more definite and thorough knowlege of the causes of disease, and the means requisite for their avoidance and elimination. The "coming man" will assiduously labor to avert the predisposing and exciting causes, and here the earnest co-operation of the hygienist and microbiologist will often render unnecessary the interference of the pharmacist.

In this work I have given in the form of appendices to the several chapters references to certain new remedies not mentioned in the text. The chapter on Lavage and Gavage of the Stomach is reprinted from the volume on Diseases of the Stomach and Intestines, which has appeared the present summer. I have to thank Dr. W. Everett Smith for an interesting supplementary chapter (written for this work) on the Pneumatic Cabinet.

It remains to add that this book comprises the Cochin Hospital lectures for the years 1884-85.

TRANSLATOR.

NEWBURYPORT, MASS., July 1, 1886.

NEW MEDICATIONS.

CHAPTER I.

THE GREAT DISCOVERIES IN THERAPEUTICS OF THE PAST FIFTY YEARS.

GENTLEMEN: I intend to continue in this hospital the instruction in therapeutics to which my medical life is devoted. Begun in the Hospital St. Antoine, this clinical teaching has already given to the world the volumes on "Clinical Therapeutics," and I desire to add to and otherwise complete a work which has not I hope, been altogether without useful results.

The commencement of my course of therapeutic instruction at St. Antoine was attended with trying difficulties by reason of the material conditions in which I was placed. To-day my task is rendered easy and pleasant by the generosity and liberality of the Directors in placing at my disposal all the conveniences necessary to facilitate and illustrate my course. Therefore I take this occasion publicly to thank the general manager and his secretary, M. Brelet, as well as the architect of this hospital, M.

Gallois, for the rapidity and dexterity which they have displayed in the execution of the different works which have transformed these ancient military barracks into a model modern hospital. For, by a happy concurrence of circumstances, we find here, united under one roof, the amphitheatre, the laboratory and the patients, so that we are enabled to carry on the work of teaching along with our experimental researches and clinical studies.

In the present course we shall not leave the domain of practice, and it is always the application to the sick person which is ultimately to decide whether the medicament supposed to be indicated is of any value. The laboratory will be of use to us almost exclusively in enabling us to ascertain the physiological, and especially the toxic effects of the medicine under consideration, for I have little faith in experimental therapeutics. Being unable to produce in animals the greater part of the diseases which affect the human species, it is impossible for us to study in them the therapeutic action of the principal medicinal substances. Ordinarily we observe in subjects under experimentation not the therapeutic action but the toxic effects of the medicament, and it is not experimental therapeutics which we realize, but experimental toxicology.

Are we then to abandon such researches? By no means, gentlemen, for a real interest attends them; they show us the more or less toxic influence of the substance which we are testing, they guide us respecting the doses to employ, they often enable us, lastly, to give a physiological explanation of the effects observed. Hence you will see every day what great advantages you can derive from experimental researches of this kind.

These tasks of the laboratory will also include the means most fitted for isolating the active principles of medicinal substances. Finally, it is by the help of these laboratory experiments that we can examine attentively the modes of elimination of medicines, and thus complete the study of what has been described under the name of *pharmacodynamic action of medicinal preparations.*

Therefore, I would say to all those who prize the study of the treatment of diseases, to all those who are attracted by these researches of experimental physiology and therapeutics, to all who wish to glean in this immense field of materia medica, to all who desire to increase the number of our really useful therapeutic agents, come to us, the doors of our wards are open to you, the laboratory, with all the means of investigation of modern science is at your disposal, and you will find in me, in Dr. Bardet, chief of the laboratory, in my internes, Legendre and Sapelier, a readiness to give you the advice and the help which you require.

But in order to be a good therapeutist, you must be a good clinician. Hence, our teaching will not be exclusive, and to the lessons in Clinical Therapeutics which I shall have the honor to give you, will be joined lectures in Semeiology, which Drs. Legendre and Sapelier will deliver every Friday, and the lectures in Medical Physics and Chemistry by my laboratory chief, Dr. Bardet, and I trust that you will derive profit from this multiple and complex course of instruction.

I shall devote this first lecture to the great therapeutic discoveries of the past fifty years. You must be tired of hearing it said that medicine has made no progress, that the treatment of diseases is just where the fathers of medicine left it. Others are free to admit that certain departments of the healing art have made advances, and point with complacency to recent valuable gains in surgery, obstetrics, and pathological anatomy, but as for therapeutics, it has not kept up with the progress made in other divisions of scientific medicine. You will hear these statements made not only by persons outside of the medical profession, but even by physicians in good standing; made, too, with such magisterial authority as to bring upon therapeutics undeserved opprobrium and contempt, and that branch of our science which ought to be the supreme end of medicine becomes a subject of little interest, and is assigned to a secondary place.

Against this scorn and contempt I utter my protest to-day in showing you that therapeutics has made progress, and it is enough for me in this connection to sum up the great gains which it has achieved in the last fifty years, to convince you that therapeutics has not been as far in arrear as has been supposed.

"To relieve pain is a divine work," says Hippocrates, and you will not be astonished to learn that it has been in the warfare with physical suffering that therapeutics has put forth its greatest efforts—efforts which have been attended with signal success, for the physician is now enabled to triumph over pain in its complete suppression. In this connection, then, I ought to speak of three grand modern discoveries: anæsthesia, the application of chloral, and the use of hypodermic injections.

ANÆSTHESIA.

The first in importance of all of these discoveries is that of anæsthesia. I know of none more admirable or more useful, as by the sole fact of this discovery therapeutics has, in my judgment, surpassed all the other medical sciences. What would become of surgery if anæsthesia did not exist? How could we perform those remarkable operations on the abdomen without the chloroform sleep? Hence Figuier was right in placing induced anæsthesia among the wonders of science, and in the same rank with the modern uses of electricity, steam power, etc.

It was on the first of September, 1846, that there took place in Boston, between Dr. Jackson and Wm. Morton, a dentist, an interview which was destined to decide the fate of anæsthesia. The latter had been seeking to obtain of Jackson a means which would enable him to extract without pain a tooth from a nervous patient. For four years Jackson had been experimenting with ether, and he had noted its anæsthetic effect. He had been led to these investigations by the researches, early in this century, of Sir Humphrey Davy on protoxide of nitrogen, and believing the occasion favorable, he proposed to Morton to administer to his patient inhalations of ether. Morton was absolutely ignorant of what ether was, and Jackson provided him with a bottle of it.

That very evening, in his own house, Morton inhaled some of the ether, and noticed that for seven minutes he completely lost sensibility of the skin. The next day he boldly attempted that famous first experiment with a patient whose name science has preserved: Eben Frost, Esq. He caused him to inhale some ether, and during the anæsthesia which ensued, he extracted a tooth without pain.

One month afterwards, October 14, 1846, Dr. Warren, of Boston, at the Massachusetts Genera Hospital, performed ablation of a voluminous tumo of the neck on a patient anæsthetized by Morton; tl patient experienced no pain. Surgical anæsthesia w discovered. But Morton, forgetful of his obligatio to Jackson, did not invite him to be present at tl test operation.

Two months after, December 22, 1846, Jober

Lamballe made the first application of etherization in France, at the Hospital St. Louis.

The year following, and only a few months after (in February, 1847), Sedillot proposed to substitute hydrochloric ether for sulphuric. A month later, viz., March 8th, Flourens, in a communication to the Academy of Sciences, studied comparatively the anæsthesia produced by sulphuric ether, and that determined by hydrochloric ether, and proposed to employ a body which Soubeiran had discovered in 1830, and which resembled in many respects hydrochloric ether; this was chloroform. In the month of November of the same year, Simpson, of Edinburgh, applied the anæsthetic effects of chloroform to the human subject, and thereafter this new anæsthetic became the rival of ether in the production of surgical anæsthesia.

[Though chloroform is more speedy in its action, and produces more complete relaxation of the muscular system than ether, and though the after-effects are unquestionably somewhat pleasanter, yet ether is everywhere recognized as the *safer* anæsthetic, and on account of the many sudden deaths which have followed the administration of chloroform, the use of this anæsthetic in some parts of the world is (at least by popular and medical sentiment) condemned.] It is a curious fact, moreover, that while the whole world was celebrating the benefits of surgical anæsthesia, he who was the first to think of applying Davy's discovery respecting laughing gas to surgical practice—I refer to Horace Wells—committed suicide, and by a strange freak of fate, he employed to accomplish his purpose etherization, which his triumphant opponents had just introduced into medical practice.

In this discovery empiricism had a place which was more apparent than real, and when we follow step by step the connection of events, we see that it was by a strictly l gical process that the discovery of anæsthesia was brought about. Davy, guided by his researches on the action of gaseous substances on the economy, employs first nitrous oxide; Horace Wells aims to apply this gas to surgery, and fails in his first experiment; Jackson suggests vapor of ether and Morton carries out the suggestion and obtains anæsthesia thereby. Sedillot endeavors to substitute hydrochloric ether for sulphuric, and Flourens proposes chloroform which has so many affinities with hydrochloric ether. Finally Simpson establishes the bases of chloroformization.

Hence, then, gentlemen, it was by a comparative study of the substances belonging to the same chemical series that this grand discovery was made. But this comparative study did not stop with chloroform, and the other members of the group of ethyls and methyls were next taken up, and a great number of substances have been found, which, without displacing chloroform, which still stands at the head of anæsthetics, none the less have rendered important services in the department of surgical anæsthesia. It was this same comparative study which led Liebreich to the knowledge of that powerful hypnotic, chloral hydrate.

CHLORAL.

Liebreich, in 1869, wishing to examine (as he himself says) the effects of certain substances which undergo decomposition in the organism, studied comparatively trichloracetic acid, its salts and chloral, and showed the hypnotic properties of this latter body, which Liebig, many years before (in 1831), had obtained by directing a current of dry chlorine upon absolute alcohol, and which Dumas studied anew in 1834.

You all know, gentlemen, the immense advantage which we daily derive from chloral, the annual consumption of which amounts to thousands of kilogrammes.

It was the same comparative study which led Cervello to counsel the usage of paraldehyde, for when you examine the atomic formula of chloral, you see that it may be regarded as an aldehyde, the trichlorated aldehyde; hence suggested itself the thought of employing this paraldehyde, which is simply constituted by the union of three molecules of aldehyde. One of my pupils, Dr. Coudray, has lately embodied in his thesis the results which he has observed in our hospital service from the employ of this new hypnotic.*

* Coudray, On Paraldehyde, Thèse de Paris, 1884.

But the discovery of surgical anæsthesia, and the introduction of chloral and its derivatives into medical therapeutics, was not yet sufficient to allay all pains, and in particular neuralgic pains. The finding of a method which has, so to speak, revolutionized medical practice in henceforth furnishing a positive and rapid means for the introduction and absorption of medicaments, ought to complete these first discoveries: I allude to the practice of hypodermic injections.

HYPODERMIC INJECTIONS.

It is to a Frenchman that we are indebted for the first idea, or at least the first practical tentatives of the hypodermic method. On the 27th of December, 1838, Dr. Lafargue, of St. Emilion, presented to the Academy of Medicine a memoir having for its title: "On the Therapeutic Effects of Certain Medicaments Introduced under the Skin." Nine years after, in 1847, Lafargue returned to this method, and noted with regret that despite the advantages which he had derived from it, *the practice of inoculation of medicaments*, as he called it, had been received with the most complete indifference, and that nobody had put it into usage.*

In order to practice these medicinal inoculations, Lafargue proposed the following means:

* Lafargue, On the Therapeutic Advantages of the Inoculation of Morphine and Other Energetic Medicaments (Bull. Gen. de Ther., 1847, xxxvii).

"A long needle is taken containing a deep groove running its whole length, which is filled with muriate of morphia reduced to a paste; thus armed, this needle is plunged into the tissues and allowed to remain there till the morphine is dissolved." It is sufficient to read this passage of Lafargue to see how little was needed to transform the method of inoculation of medicaments into that of hypodermic injections, and this is what was done thirty years ago by an English physician by the name of Wood.

Guided by the labors of Lafargue, guided also by the tentatives made by Ferguson and Pravaz in the radical cure of varices by coagulating injections, Wood proposed the use of the instruments now employed for the introduction under the skin of medicinal substances, and in 1859 my regretted master, Behier, made known all the advantages which accrue from the hypodermic method.

You know to-day the uses as well as the abuses of subcutaneous injections, and what advantages we derive from them. There is no pain which is not allayed by this medication, and we can affirm that by its means we always give relief to our patients.

An English physician by the name of Rynd has disputed with Wood the priority of the discovery of hypodermic injections, and has claimed that in 1841, that is to say, almost ten years before Wood published his memoir, he was in the habit of treating sciatica by hypodermic injections. But, when you read attentively Rynd's article, you perceive that he was not the inventor of the subcutaneous method from the point of view of the introduction of calmative medicaments, such as morphine, but rather from that of injections for local effect, which our colleague, Dr. Luton, of Rheims, was the first to practise in 1869, and to which in 1875 he devoted his able treatise on subcutaneous injections for local effect. In fact, Rynd employed to cure sciatica a mixture of morphine and of creosote.

I cannot here, gentlemen, point out all the advantages of the hypodermic method. Applied first to the introduction of calmative medicaments, this method was soon generalized, and you know to-day that it is the only sure means of introducing medicinal substances, and if we are to-day seeking with so much care to find the active principles of medicines, it is in order to put in practice this mode of introduction.

To all these new means of cure has been added the discovery of a substance which by its action on the bulbus and the entire cerebro-spinal axis was destined to render immense service in the treatment of nervous affections, and enable us to cure epilepsy in half the cases; I refer to BROMIDE OF POTASSIUM.

In 1826, Balard discovered bromine; two years afterward (in 1828), a Fellow of the Faculty of Montpellier, Pourchet, applied bromine, or rather its combination with potassa which he called hydro-bromuret of potash, to the treatment of scrofula and goitre, thus substituting, by an effort of reasoning easy to understand, bromine for iodine, its congener, in the first application which Coindet, of Geneva, several years before (in 1820), had made of this iodine in the treatment of diseases, thus creating the iodide medication, which to-day renders us such great service.

It is this same idea that inspired the attempts made long afterward, from 1840 to 1850, by Puche and Ricord, in the Hospital du Midi, to substitute bromide of potassium for the iodide in the treatment of syphilitic affections, which tentatives served as a basis for the theses of Rames of Aurillac, and of Huet, of Montargis, theses approved in 1850.

The year following, in 1851, Locock, taking a hint from a fact communicated in 1840 by a German physician, Otto Graff, relative to the anaphrodisiac properties of bromide of potassium, applied for the first time this medicament to the treatment of certain neuroses, in which he thought that the genital sense played an important part. The marvellous results which he obtained in epilepsy, results soon verified in France, laid the foundation of the bromide medication, which now occupies so large a place in the therapeutics of nervous affections, that we ask ourselves how we could get along without this precious medicament.

You see then, gentlemen, that the art of healing, or more strictly speaking, the art of relieving pain, has in a short space of time profited by five important discoveries: in 1846 occurred the discovery of etherization; in 1847 the application of chloroform to medicine; in 1851, the application of the bromide medication to the treatment of neuroses; in 1853, the introduction of the hypodermic method into therapeutics; in 1869, the discovery of the hypnotic action of chloral.

While progress was being made in this direction, new horizons were opened to therapeutics by the discovery of a series of bodies which the industry of the chemist was succeeding in extracting from the residue of the fabrication of coal gas. I allude to the PHENOLS and OXYPHENOLS.

Here, too, it was not pure empiricism which led to these discoveries, and they were the result of two grand factors: on the one hand the new views which Pasteur had put forth respecting the nature of fermentations, and on the other the incessant progress of chemistry. The new ideas on fermentation show us its analogy with putrefaction, and especially the predominant rôle of micro-organisms in these phenomena, and finally the capital importance of antiseptic substances in preventing the development of these proto-organisms.

All these discoveries threw a new light on the pathogeny of accidents complicating wounds, and it is easy to understand the zeal with which surgeons pressed into this new therapeutic path, and with an enthusiasm the greater from the fact that chemistry had just discovered, as a result of the distillation of coal and the analytic decomposition of tar, a new series of bodies to which has been given the name of *aromatic series.*

I took part in the first trials with these products, and the observations which, while in the service of Velpeau, whose interne I then was, in 1859, I collated concerning the powder of coal tar,* recommended by Cocne and Demeaux, helped to make the report which my illustrious master some time after presented to the Academy of Medicine. The action of the coal tar was not at all doubtful, but the question was often asked if these effects were not due to some principle in the tar rather than to the tar itself, and this led to the employment of phenic or carbolic acid, which Runge in 1834 had extracted from tar, and to which, as being a by-product of the fabrication of illuminating gas, he had given the name of *phenol* from the Greek Φαίνω, I illumine. Lemaire in 1861 was the first to show the useful applications which might be made of phenol, and from this time we have seen medicine and surgery employ all the bodies which are derivable from these phenols and from their combinations, and successively salicylic acid, kairin, resorcin, etc., have been brought before the profession. But the internal application of these phenols and oxy-phenols showed us that these antifermentative medi-

*A mixture of one part gypsum and three parts coal tar, owing its properties chiefly to the phenic acid and the benzine which it contains.—Trans.

caments all possess a very important property, that of lowering the temperature, thus assimilating the febrile process to a process of fermentation, and thereupon a new group of antithermic medicaments was constituted.

This class of antithermic medicaments, to which I shall shortly devote a whole chapter, has in our day assumed a capital importance.

Since the introduction of the thermometer into clinical practice, and since the custom was establisned of daily noting the cyclical march of diseases by the careful observation of the thermometer, a considerable importance has been attached to the temperature in diseases, an importance which has perhaps even been exaggerated, and there is a tendency always to endeavor to bring back to the normal the inordinate temperature of febricitants. You will see that we can attain this end by the employment of medicaments the discovery of which is quite recent, and which can lower at pleasure the febrile hyperthermia.

Among these medicaments, there is one which, by its special action in rheumatism has a rank without a peer; I allude to salicylic acid. It is to Stricker, in 1876, that we are indebted for the first exhibition of salicylic acid in rheumatism; the application in this case was, I am aware, absolutely empirical. From time immemorial, the infusion of willow bark had been employed in the treatment of rheumatism; the discovery made by Leroux in 1827 of salicin had been applied only to the treatment of intermittent fevers, and when Stricker proposed to treat rheumatism with salicylic acid, it was a notion absolutely empirical which guided him. Moreover, we are still ignorant of how this medicament acts, while recognizing its marvelous efficacy, since in the immense majority of cases, it causes disappearance of the atrocious pains and fever provoked by acute articular rheumatism.

Such, gentlemen are the precious acquisitions of therapeutics the last fifty years. To all such as may deny that therapeutics has made progress, it will be sufficient to point to the facts I have just indicated, and it will be made plain to any unprejudiced person that therapeutics, like the other branches of medicine, has not failed to make great advance.

Let us indulge the belief, however, that this is but the beginning. The discoveries of our illustrious countryman whom the entire scientific world has lately so signally honored at Edinburgh and at Copenhagen, are but a foretaste of future gains, and when I look at the rapid progress that is being made in researches of this kind, and when I think of the revolutions which the art of medicine is destined to undergo as a result of the more complete knowledge of the micro-organisms, and of inoculations of attenuated virus, I am ready, in my turn, to exclaim: "happy are our young men, for they shall see great things."

CHAPTER II.

ON NEW CARDIAC MEDICAMENTS.

GENTLEMEN: I shall devote this lecture to a consideration of the new cardiac medicaments, and by that word *new* I mean medicines which have been introduced into therapeutics the past five years.

Three new medicaments have been recently brought into repute in the treatment of heart diseases, and it is to these chiefly that I shall call your attention: convallaria, caffein, and trinitrine; the two first being applicable to mitral affections and acting as tonics to the heart; the third, on the contrary, being chiefly of use in diseases of the aortic orifice and aorta. This distinction between mitral and aortic diseases, from the standpoint of therapeutics, is one which I endeavored to establish in my work on Clinical Therapeutics, and seems to-day to be generally admitted.*

You know that from the point of view of treatment I have maintained that it was necessary to make a marked difference between mitral and aortic affections. In the first, we must endeavor to augment the force of the heart to make it equal to its tasks, and we attempt this by means of the group of medicines known as *tonics of the heart.* In order better to mark the time when the cardiac tonics are of the most ser-

* See Vol. I., Part I.

vice, clinicians have divided into several periods the cycle which the heart affection traverses, from the simple lesion of the orifice to the cachexia, and Fernet and Huchard have characterized these periods by a peculiar name. In the first period, to which they give the name *eusystolic*, there is lesion of the orifice without alteration of the myocardium; hygienic means are alone of utility in this period. In the second period, which they call *hyper-systolic*, cardiac hypertrophy comes in to compensate the troubles due to the lesion of orifice, and here, too, hygienic treatment suffices. In the third period, called *hypo-systolic*, the equilibrium is broken, the compensation is insufficient, the tonics of the heart are necessary. In the last period, called *asystolic*, the heart is affected with fatty degeneration, there is, as Gubler says, cardio-plegia, and the most energetic of our cardiac tonics, caffein perhaps excepted, become impotent to combat this state.*

In diseases of the aortic orifice therapeutics must be directed differently, and we are now concerned with combating the two symptoms which result from lesions of this orifice, namely, the cerebral anæmia and the irritation of the nerve plexuses which surround the aorta, and it is here that the medicaments which stimulate the cerebral circulation, and those which diminish nervous sensibility, find their application.

* Fernet, on Digitalis in Diseases of the Heart (Bull. et Mem. de la Soc. de Therapeutique, 1882). Huchard, on Caffein in Affections of the Heart (Bull. de Ther., Ciii. p. 145).

It must be understood that this distinction in treatment is only applicable to one phase of diseases of the heart, and that in the case of affections of the aortic orifice, insufficiency, for example, there arrives a moment when, in consequence of dilatation of the heart, there is mitral insufficiency; then all the troubles which characterize this latter disease appear, and tonic treatment is imperatively needed, together with those remedies that favor the cerebral circulation and relieve distress.

As for the tonics of the heart, digitalis deserves the first place; next in importance (strange to say), comes bromide of potassium, as I have shown in my Clinical Therapeutics; next in order we should now add convallaria and caffeine.

CONVALLARIA MAJALIS.

Convallaria majalis (muguet, lily of the valley), is a plant with rhizoma, which grows in abundance in our woods, and which presents at this very moment its racemes of odorous white flowers. The first analyses of this plant were made in 1858, by Wals, who found there two glucosides, convallamarine and convallarine. In 1865, Marmet studied the physiological action of these two glucosides, and, according to him, convallarine is purgative, and convallamarine toxic. In 1883 Ernest Hardy, then M. Tanret, each independently, perfected the mode of extraction of these two substances.

In China, the inhabitants make use, as a succulent vegetable, of the young shoots of a species of convallaria, *polygonatum japonicum*, which has with them much the same place as asparagus has with us.

In Russia, they employ, as a diuretic another species of convallaria, the *convallaria polygonatum*, so well known in our woods under the name of Solomon's seal; such use of this plant, probably, first led the Russian physicians to make trial of the lily of the valley in heart affections. I say "first," for it is probable that the Russian physicians did not know that in the middle of the 18th century (1745), Cartheuser, the celebrated physician of Frankfort on the Oder, in his rudiments of Materia Medica, mentions among the numerous properties which he ascribes to the lily of the valley, that of calming cardiac palpitations, and of toning up the weak heart, and that Ferrein, in 1770, mentions, also, the diuretic properties of convallaria. In his recent thesis on convallaria, Nogues has clearly proved the priority which is due to Cartheuser.* Ernest Labbée has, however, shown still more recently that Matthiolus, in 1580, in his communications of Dioscorides, refers to the lily of the valley as being very beneficial in palpitations; "it fortifies the heart," he says.†

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* Cartheuser, Matiéres Medicales. Ed. 1745, Perrein, Matiéres Medicales, 1771. Nogues, Thèse de Paris, 1883.

† Ernest Labbée, Du Convallaria Maialis (Gaz. Hebd. June 13, 1884).

However this may be, all these facts had been forgotten when appeared the first researches, made under the inspiration of Botkin and his pupils, Bogojavolenski and Troitzi.

Bogojavolenski pointed out, in 1880, the results obtained by the employment of convallaria. Isaieff, Kalmikof, in 1881, Troitzi, in 1882, Dary, in 1881, and finally Germain Sée, in 1882, repeated these experiments, which he completed by new researches, and made known the advantages which we may derive from the employment of this medicament.

The researches of the Russian physicians, those of Germain Sée and of Bochefontaine, and those still more recent of Coze and Simons, have shown that in animals, and especially in cold-blooded animals, the divers preparations of convallaria, have a real tonic action on the heart. The sphygmographic tracings which these last two experimenters have furnished, show that not only convallaria diminishes the number of pulsations, but that it does this while augmenting the amplitude of the contractions. It is to this period of slowing and augmentation of amplitude that these experimenters have given the appropriate name of the *therapeutically useful period* of convallaria, and when you compare this useful period with that which belongs to digitalis in like doses, it is found that the superiority is to be assigned to convallaria.

From the standpoint of its action in man, this medicine is proved to be one of the most powerful diuretics known, and Prof. Sée ranks it before digitalis. It is applicable, then, especially to mitral diseases with dropsy; at the same time, it is well to make this reserve, that when there is albuminuria, the diuretic action is considerably lessened.

Convallaria calms also the palpitations and disorders of the heart which are purely functional in character, and if I add that the preparations of this medicament have no toxic action in man, I shall have pointed out their principal advantages.

Since the labors of the Russian physicians, and especially since the communication of Prof. Sée, there have been a multitude of trials made with convallaria, and we know to-day, thanks to this experimentation, the true value of this medicament.

In Germany canvallaria has had but little success, especially if we are to judge by the article published by Stiller, who, in twenty-one cases of affections of the heart where convallaria was employed, saw no positive results, except in two cases.*

In America convallaria seems to have had better results, as you will see by referring to the communications made by my excellent friend, Dr. Hurd, of Newburyport, and Drs. Beverley Robinson, Taylor, Polk, Smith,† and others, all of whom have had success with this medicament.

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*Stiller, Versuche über Convallaria Maialis bei Herzkrankheiten (Wien. Med. Woch., No. 44, 1882).

† Therapeutic Gazette, 1883, p. 283, also pp. 365, 126, etc. See also Medical Record, vol. 23, p. 413.

In France, if we can base our opinion on treatises published since the communication of Prof. Sée, and discussions before the Society of Therapeutics, it is plain that if the profession is agreed in admitting the diuretic effect of convallaria, the action of this medicament is nevertheless regarded as very uncertain. This is the view very clearly expressed by Peter in his Clinical Lessons on Diseases of the heart; by Constantine Paul, in his late work,* and it is also my conclusion. In fact, in the numerous trials which I have made of convallaria, I have sometimes met with success—in a small number of cases it is true, but very generally with failure. Despite this uncertain action, however, I believe that we do well to continue prescribing this tonic of the heart, because it is perfectly safe, and because it can be utilized at such times as we are obliged to leave off the administration of digitalis.

You know, in fact, that everybody is agreed at the present day in the expediency of not giving the preparations of digitalis continuously, and in interrupting for a certain time treatment by digitalis, to renew it again after a suitable interval. It is during this period of suspension of the foxglove that you can employ convallaria, taking care, of course, not to attribute all the diuretic effects thereafter obtained to this medicine, for, as you know, the action of digitalis on the

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* On Diseases of the Heart. Published by Wm. Wood & Co., Medical Library series, 1884.

kidneys is prolonged for some time after you cease its administration.

How and in what dose shall you give convallaria? All parts of the plant, flowers, leaves and root, have been employed. The more active parts are the flowers; then the leaves; the plant may be used in the fresh state in the form of alcoholic extract, or in the dry state, as tincture or as extract. The infusion is an untrustworthy preparation. The extract is generally used; that may be either fluid or solid; that made from the flowers and the leaves is preferred. I here place before you the various extracts of flowers and leaves, which have been furnished me by M. Adrien, and you observe that they are of brilliant black appearance, of a quite peculiar bitter savor, and soluble in every proportion in water and in alcohol. A good diuretic mixture, of which a tablespoonful three or times a day may be given, may be made by rubbing up a couple of drachms of the extract of the flowers and leaves, in eight fluid ounces of decoction of broomtop. The American fluid extract, made by Parke, Davis & Co., is quite a reliable preparation. I here show you a sample. You remark that it has perceptibly the odor and taste of the flowers. The dose of these liquid extracts is from ten to thirty drops, three times a day. The dose of the solid extracts is about ten grains, but the extract prepared from the root is very much weaker. Whatever form you may choose, do not count on obtaining certain results, and be prepared for disappointment.

CAFFEINE.

Quite different is the preparation of which I am now to speak. Caffeine is, in fact, one of the best tonics of the heart, and in the last stages of cardiac affections it will render you more service than digitalis. Extracted for the first time in 1820, by Runge, optained under the name of theine, from tea, in 1827, and in 1840 by Martius, from *guarana paullinia*, under the name of guaranine, also from Paraguaian maté, under the name of matein, by Stenhouse in 1840. caffeine, which has an atomic formula of $C_8H_{10}N_4O_2$, may be got from these different substances, to which we may add that precious fruit on which we are experimenting this moment in our hospitals, and of which the negroes of Central Africa make so great account, kola (sterculia kola), and which contains, as has been shown by the researches of Heckle and Schlagdenhaufen, caffeine and theobromine, and which has even more caffeine than coffee; the last, in fact, contains from 70 centigrammes to a gramme and a half in every hundred parts, while kola contains twice as much.

Caffeine presents itself under the form of a white crystalline salt, soluble in 90 parts of water. As Tanret has shown, its basic properties are very weak and there does not exist properly speaking, either acetate, citrate, valerianate, or lactate of caffeine. The bromhydrate and the chlorhydrate appear in the form of beautiful crystals, which are, however, insoluble.

Tanret, therefore, has proposed a more stable combination of caffeine with salicylate or benzoate of soda. The first contains 45 per cent. caffeine, the second 61 per cent. These combinations being quite soluble, and having no local irritant action, may be used by the subcutaneous method. These are the formulæ which Tanret has proposed.

℞ Benzoate of soda, 2.95 (gr. xliv).
Caffeine, 2.50 (gr. xxxvi).
Distilled Water, 6.00 (gr. xc).

M. Fiat Solutio.

Each syringeful, or about 15 minims, contains a full dose of caffeine. (In other words, a cubic centimetre [about 20 drops] has 25 centigramms).

The second formula is as follows:

℞ Salicylate of soda, 3.10 (gr. xlvii).
Caffeine, 4.00 (ʒ i).
Distilled Water, 6.00 (ʒ jss).

M. Dissolve with the help of heat. Each cubic centimetre contains 40 centigrammes caffeine.

You need, however, resort to the hypodermic method only in exceptional cases, as when the patient is taken with vomiting, or when the caffeine provokes gastric irritation and pain. Ordinarily the caffeine may be given in pills, in granules, in capsules, or in potion.

The pill form is not much employed. This results from the fact that the pills may pass through the intestinal tube without undergoing solution and absorption, or the absorption may be incomplete, which is a disadvantage, seeing that caffeine is dear. The granules are good preparations, but are open to the same objection, and to get the full benefit of them large doses must be given—even two grammes (ʒ ss) a day.

As for the capsules, this is an excellent mode of administration, and you may prescribe in this form doses of from 25 to 50 centigrammes (4 to 8 grains). They have, however, the inconvenience of causing distress in the stomach (one of the disadvantages of caffeine in concentrated form). Therefore, I prefer the liquid form, giving the medicine with a large quantity of the fluid menstruum.

You may, for instance, give three times a day a ten-grain dose of caffeine (pretty large doses are necessary, as I shall tell you hereafter); this may be given along with ten grains of benzoate of soda, a little syrup, and enough fennel or peppermint water to make up three or four ounces. The following formula may be more convenient for private practice:

℞ Caffeine, 7.00 (gr. 105).
Benzoate soda, 7.00 (gr. 105).
Water, 250.00 (℥ viij.)
M.

Each tablespoonful of the above mixture contains about 50 centigrammes (or 7½ grains) of caffeine.

Leaving one side all which does not concern the action of caffeine on the circulation, I shall take up this aspect of the question, and shall now consider the physiological effects of caffeine on the heart.

When you take a glance at what has been written relative to the action of caffeine and of coffee on the heart, you observe that the opinions may be ranged in three groups; some, as Gentilhomme, of Rheims, claiming that caffeine has no action on the heart; others, as Trousseau, Rognetta, Dettel, etc., that it accelerates the pulsation of the heart; others still, notably, Caron, Meplain, and Fonssagrives, that it slows the pulsation of that organ.

Whence comes this diversity of opinions? It results from this fact, which is applicable to so many of the tonics of the heart, that the toxic effects are absolutely opposed to the therapeutic effects, and while caffeine in moderate doses (as Giraud and Leblond have proven)* diminishes the pulsations while augmenting the vascular tension—*i. e.*, by acting as a cardiac tonic—in larger doses it produces toxic effects, the heart-beats are accelerated and become irregular; the caffeine has become a poison. You see then that the effects obtained by experimentation on animals have been in accordance with the dose administered.

It was in 1839 that an anonymous writer in the Bulletin General de Thérapeutique, first pointed out the diuretic action of coffee and its applicability to

* Giraud. Contributions to the physiological and therapeutical study of Caffein. Thèse de Paris, 1883. Leblond, Thèse de Paris, 1883.

the treatment of dropsies; Zwinger, a Dutch physician, had, however, as early as 1725, recommended coffee for dropsy. Honoré, in 1846, published an article in which he reported three cases of albuminuria with anasarca, treated successfully by infusion of coffee.

In 1863 appeared the first treatise on caffeine, by Kœschlakoff of St. Petersburg, who reports two cases of parachymatous nephritis with hypertrophy of the heart treated by caffeine; a remarkable diuretic action was noted, which was simultaneous with slowing of the heart's pulsations and increase of arterial pressure.

In 1866 Prof. Jaccoud took the lead in the employment of caffeine in cardiac affections, and we find in his *Clinique Medicale de la Charité*, this medicament recommended, not only for diseases of the heart, but also for the treatment of renal diseases with albuminuria. In 1877 Gubler, who considered caffeine as the ideal diuretic, made a communication to the Societé de Thérapeutique in which he strongly vaunted the remarkable effects of caffeine in cardiac affections. Still later, Brakerwidge, who has made more experiments with citrate of caffeine than almost any other man, has called attention to the extraordinary merit of caffeine as a diuretic.

Thus far, however, but small doses of caffeine had been given, and this was in accordance with the practice of Gubler, who did not exceed the amount of eight grains a day. Trials simultaneously made at Lyons by Prof. Lepine, and at Paris by Dr. Huchard, showed that these doses were insufficient, and that we ought not to hesitate to give as much as two grammes (or half a drachm) a day of this medicament in order to obtain all the benefit which may be derived from it; and you will find in the theses of Giraud and Leblond, the results obtained in the practice of Lepine and Huchard with these large doses of caffeine.

The great advantage of caffeine is that it appears to possess diuretic effects even when the kidneys are badly damaged, and you may even get good results with it in advanced stages of heart disease. You will be able to see in our service veritable resurrections effected by this marvelous therapeutic agent, and this even in aged persons; therefore, you ought to have these facts always in mind, and remember that in the asystolic period—period of cardioplegia, as Gubler called it—when you have exhausted the remedial powers of all the other cardiac tonics, you may still obtain signal success with caffeine.

Kola nuts, with which you have seen me experiment recently in our wards (having obtained a supply directly from Dakar), may be utilized in these cases. Containing, as they do, a considerable quantity of caffeine and theobromine, with a fatty matter, and being thus constituted an aliment and a tonic of the heart, our trials with this new medicament show that this estimate is well founded. How will you prescribe kola? The three preparations the most in use are the alcoholic tincture, the wine and the elixir. The first may be given in the dose of one to two teaspoonfuls; the wine in double this quantity, *t.i.d.* The elixir is made by diluting the alcoholic tincture with an equal quantity of syrup; dose, three or four dessertspoonfuls a day. The infusion (which resembles infusion of coffee) is also a good preparation.

The tracings obtained in animals by Monnet show that kola is a powerful heart tonic. I have not, however, seen the marked diuretic results from kola that some authorities claim to have noticed; perhaps because I have not given it in sufficiently large doses. (See the thesis of my pupil Monnet on Kola, published in 1884; of this an abstract was printed in the Therapeutic Gazette, 1885.

I ought here to mention erythrophleine, which Gallois and Hardy have extracted from the *erythrophleum guinenseum*, and which has been physiologically studied by Professor Germain Sée and Dr. Bochefontaine recently. According to these experimenters, erythrophleine acts as a tonic of the heart. The toxic principle of erythrophleine is almost the same thing as amorphous digitaline. I have given the tincture of erythrophleine in 40-drop doses to patients suffering from mitral disease, but with variable results; sometimes I have obtained a powerful diuretic action, and sometimes no action whatever. Further trials with this drug are necessary.

TRINITRINE (NITRO-GLYCERINE).

This new remedy is only of use in diseases of the aortic orifice. You well know the difference, from a therapeutic point of view, between mitral and aortic affections.

In aortic disorders, what we have to combat are the symptoms arising from the cerebral anæmia which comes from the trouble inflicted on the arterial circulation, and which manifests itself by pallor of the countenance, attacks of vertigo, lipothymia, and even syncope; we are called upon also to mitigate the distress which accompanies these sorts of affections, whether this be in the form of symptomatic neuritis of the cardio-pulmonary plexus, a result of the propagation of the peri-aortic inflammation to the numerous plexuses which surround that vessel, and thence to the peripheral nerves; or whether we are concerned with that veritable angina pectoris, of which Huchard has so well explained the mechanism in his recent work, showing us that these horribly painful paroxysms of thoracic angor result from ischaemia of the cardiac muscle.

You all know from a physiological as well as from a pathological standpoint, the excruciating suffering which accompanies sudden arrest of the circulation in a department of the economy furnished with sensory nerves, and you doubtless recall to your mind the distress of patients affected with senile gangrene. When the coronary arteries become obliterated, the same painful phenomena are manifested and extend to the entire cardio-pulmonary plexus. The facts of Huchard, of Potain, and of my colleague, Herard, communicated to the Academy of Medicine, illustrate well the mechanism of angina pectoris.

Every medicament which energizes the cerebral circulation and that of the cardiac muscle on the one part, and calms pain on the other, is then useful in the treatment of aortic affections.

Opium, and especially morphia, give excellent results in these affections, and precisely by reason of the physiological properties of this medicine, which acts in these cases as a tonic and as a calmative. I have also advised in like cases the nitrite of amyl. This nitrous-amyl ether, studied these late years, physiologically, by Guthrie, in 1859, in 1863 by R. Richardson, and of which you will find an account in the thesis of Marsat (1875), and of Veyrieres, presents this curious property of being a vaso-dilator poison, especially for the capillary system of the encephalon, and it is only necessary to breathe as you have seen done, a few drops of this medicament, to obtain a marked congestion of the face, which extends to the deeper parts, as you could convince yourself by direct examination of the brain in animals, or by ophthalmoscopic examination.

I have then employed the "congestioning" properties of this drug in the treatment of aortic affections, and in the first edition of my lectures on Clinical Therapeutics, nearly seven years ago, I called attention to the good results which may be obtained from nitrite of amyl; only this medication has not come into general use, and this, for two reasons more especially: 1st., on account of the transitory effects of the medicine; next, on account of the tolerance of the economy which, soon becoming habituated to these effects of vascular dilatation, fails to derive a therapeutic benefit. Therefore, I have recently substituted trinitrine for nitrite of amyl, the trinitrine having all the advantages of the other without the disadvantages.

Trinitrine was discovered in 1874, by Sobrero, and it was applied to the arts by a Swedish engineer called Nobel, in 1864, under the name of dynamite, and you are all acquainted with the uses which have been made of this substance by miners and engineers. It has also received the name of nitro-glycerine, for, in fact, trinitrine may be considered as a glycerine in which three atoms of hydrogen are replaced by three atoms of hyponitrous acid. In fine, homœopaths have utilized the substance under the name of glonoine.

From a pharmaceutical point of view you should make use only of the one-per-cent. alcoholic solution, adding 10 drops to 100 grammes of water, of which

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mixture a tablespoonful may be given, morning noon, and night.

The prescription may be written as follows:

℞ Alcoholic sol. trinitrine (1 per cent.), gtt. xxx.
Water, ℥ x.
M. Sig. A tablespoonful three times a day.

You can also employ the hypodermic method, using the following solution:

℞ Sol. trinitrine (1 per cent.), gtt. xxx.
Cherry laurel water, grammes x.
M. Sig. For subcutaneous use.

Every fifteen minims contains three drops of the solution of trinitrine.

When you study the physiological action of this medicine, you observe that as far as the toxic properties are concerned, experimenters have advanced opinions the most opposite, and while Bruel regards it as one of the most energetic poisons, we see Vulpian on the contrary, maintain that its action is almost nil in animals, and in the experiments which I undertook anew with De Marieux, who has written an admirable thesis on this subject, we discovered why this objection exists. It is, in fact, because while trinitrine seems to have a very energetic action on man, its physiological effects are scarcely appreciable in animals, as the dog and the hare, so that while ten drops of a one-per-cent. solution determine in man toxic phenomena, you can introduce into the system of dogs as much as three drachms of the solution, and a proportionately large quantity in hares, without producing symptoms of poisoning. This shows you one of the difficulties of experimental therapeutics, and how careful you should be, in concluding from experiments on animals, as to what should take place in man.

When then you introduce under the skin of a man, three or four drops of trinitrine, you observe in a few seconds congestion of the face, the skin becomes warmer and is covered with sweat, the eyes are injected; the individual has headache, buzzings in the ears; it seems to him, as he says, as if his head would burst; the beating of the heart becomes more active. These effects are not merely localized at the periphery, they may also be observed by the ophthalmoscope in the optic disc; the deeper parts are flushed as well as the peripheral. These you see, are the same phenomena as those which are determined by nitrite of amyl, with this difference that the effects are more lasting.

It is to the homœopaths that we owe the first medicinal application of trinitrine, and in 1848, almost as soon as it had been discovered, Hering of Philadelphia, recommended this medicament in homœopathic doses for certain cerebral affections, and faithful to his principles, he prescribed it especially in cases of cerebral congestion and of apoplexy. Dudgeon, in 1853 advised it under the same conditions.

In 1858 Field proposed trinitrine for certain neuroses, as epilepsy. Murray, in 1879, made the first trial of this medicament in angina pectoris, and finally, Mayo Robson, in 1880, advised it for albuminuria. In France it is only since the publication of Huchard's work, in 1880, that we seem to be definitely decided as to the therapeutic applications of trinitrine, and this medical authority has shown us that its principal utility is in the treatment of angina pectoris, and here I must enter upon certain details.

It seems to-day demonstrated by the facts communicated by Potain, Huchard, and still more recently by Herard, that angina pectoris results from ischæmia of the myocardium, and there take place on the part of the heart, phenomena quite analogous to those which supervene in senile gangrene, and you easily understand why the pain of angina should be so intense when you think of the cruel suffering which attends senile gangrene.

Every medicament which energizes the capillary circulation of the heart or of the parts of the nervous system which innervate it, is then applicable to these cases, and this it is that explains the relief which vaso-dilator medicaments give. Trinitrine is not only applicable to the treatment of angina pectoris, but also to all the affections of the aorta, constriction and insufficiency, in which we observe cerebral ischæmia, and in individuals suffering from such affections of the heart, where you observe vertigo, lipothymia, syncope, or other troubles dependent on this cerebral anæmia, you can still use with success the same medicine.

More than this, apart even from diseases of the heart, in intense chlorosis, in neuralgias from anæmic causes, in certain cases of hypochondriasis where the vaso-motor intestinal troubles by their intensity induce a veritable cerebral anæmia, you can still use to advantage trinitrine.

Such, gentlemen, are the principal modifications which have been introduced into the treatment of diseases of the heart, the last few years. They are, as you see, important and useful, and in my next lecture I shall undertake the consideration of a subject fully as important. I allude to the new methods of treating stomach diseases.

APPENDIX TO CHAPTER II.

ADONIDINE.

Adonidine is the active principle of the *Adonis Vernalis*, a ranunculus, from which it was first extracted by Vincenzo Cervello in 1882. Adonis was applied to the treatment of diseases of the heart in 1879 by Bubnow, assistant of Prof. Botkin, of St. Petersburg. These trials were repeated in France by Lesage and Mordagne, and by Huchard and Eloy. Dujardin-Beaumetz experimented with adonidine in his hospital service in 1884. In 1885 Desplats and Durand published interesting papers on the cardiotonic properties of adonis.

Adonidine, the glucoside of adonis, is the most convenient preparation to use. The dose of one third of a grain (20 milligrames) should not be exceeded; if more than that is given vomiting and intense gastric distress are produced. It is a good plan then to give every day one or two pills of a centigram (1-6 grain) and you will obtain, especially if the administration be long continued, a real tonic effect on the heart; there will be increase of the arterial tension, the beatings of the heart become regular, the pulse diminishes in frequency, and diuresis is augmented. Adonidine then seems to have the same action as digitalis, without being attended with any danger of cumulative effects.

SPARTEINE.

Sparteine is the product of a species of broom-top, spartium scoparium; it is the alkaloid of the broomtop: the sulphate is the salt employed. The sulphate of sparteine is administered by centigrams, and as much as ten centigrams a day should be given, in pills or in syrup. Houdé's formula is as follows:

℞ Sulphate of Sparteine, gr. v. (cg. 30).
Syrup Aurantii Cort., ℥ x. (gms 300).

M. Sig. A tablespoonful contains two centigrams (⅓ grain) of the active principle.

Laborde was the first to make known the tonic action of sparteine on the heart, and Germain Sée has shown us its therapeutic uses. Sparteine seems especially to be a regulator of the beatings of the heart. Sée commends it highly as a cardiac tonic.*

CACTUS GRANDIFLORUS–CEREUS BONPLANDII.

Although no thorough testing has ever been made of these plants which still await experimental

*From the authors' second edition of New Medications. Bibliography: A. Durande, *Etude sur l'action comparée des médicaments cardiaques* (*digitale, caféine, convallaria, adonidine.*) Thèse de Paris, 1885, et *Bull. de thérap.*, t. CX, 30 Jan. 1886, p. 65.—Espina, *Riv. de med. y cir. pract.*, Madrid, 1884. —Bubnow, *St. Petersburger Medic. Woch.* 1879, 1880 et 1882. —*Ueber die physiologische und therapeutische Wirkung der Adonis vernalis* (*Deuts. Arch. f. Klin. Med.*, Band XXXIII, Aeft, p. 262, 1883).—Vincenco Cervello, *Arch, italiennes de bio-*

investigation, both, which are of the cactaceæ family, have some reputation in the United States as heart tonics. The late Dr. Austin Flint in his "Clinical Medicine" speaks of the cactus grandiflorus as a valuable cardiac nervine and tonic in five minim doses.

Dr. Richard E. Kunze, of New York, publishes in "New Preparations" a report on cactus, and gives several observations illustrative of its advantages in weak heart from nervous irritation or exhaustion and valvular deficiency; we make the following extract from his paper:

"*Case of Nervous Palpitation.* Miss Sara C., æt. 16, a dark complexioned girl of delicate figure, applied for advice August 8th, 1878.

"She had suffered from attacks of palpitation for nearly a year, which for the last four weeks were followed by severe pain in the præcordia. Dyspnœa was a quite troublesome symptom of late, and succeeded by 'incubus.' Palpitation easily induced, and

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logie, 1882.—Jehan Mordagne, *Etude sur l'Adonis vernalis* (botanique, chimie, physiologie, pharmacologie). Paris, 1885. Huchard, *De l'Adonis vernalis* (*Bull. de la Soc. de thérap.*, Déc. 8, 1885).

Houdé, *De la Spartéine* (*Bull. de thérap.*, t. CIX, 1885, page 510.

Laborde, *De l'action toxique et physiologique de la spartéine* (*Soc. de biol.*, 1885). Germain Sée, *le Sulfate de spartéine, un nouveau médicament du cœur* (*comptes rendus de l'Académie des sciences, 1885*.

sure to be followed by sharp, shooting pains. She is of the nervous diathesis and easily excited. These nervous attacks are succeeded by temporal headache. Even in the night she is awakened with an occasional attack of palpitation. Another feature of the case is a copious perspiration following every paroxysm, which first made its appearance three or four months ago. Appetite not very good. Menstruation perfectly established during the past six months.

"Found the pulse soft, regular, and 108 per minute. Cardiac sounds of a tumultuous character, yet regular in time, and accompanied by chest vibration. The sounds were the loudest in the upper cardiac region. Noticed a bellows murmur in the region of the fourth left costo-sternal articulation—its maximum intensity. I prescribed:

℞ Tinct. cereus grandiflorus, ℥ jss.
Sig. Ten to fifteen drops three times a day.

"Aug. 22.—This patient made such rapid improvement that she did not have to take the medicine in maximum doses. In fact, relief was obtained in such a short space of time that it never occurred to her mind to report in person. She was cured of that troublesome palpitation and quite relieved of all previous nervousness.

"*Case of Hypertrophy of the Heart; with Valvular Deficiency.* Mrs. Mary C., widow, aged 41, had just left the wards of Roosevelt Hospital, of this city, where she had been an inmate for six months, and was discharged because incurable. She called on me July 5th, 1878, to get relieved of the anguished state of her mind pending severe paroxysms of palpitation. It should be stated that pericarditis was the original cause of her trouble, and finally led to dropsical effusion, with albuminous urine and other bad symptoms, due to heart failure. She stated that while using digitalis in the hospital she came near losing her life from the effects of large doses administered, which resulted in excruciating attacks of "cramp" of the heart, so that she refused to take any more of that medicine. It was the only medicine she had used during the past six months, and from rest and good nursing she experienced a more decided relief than from the former.

She complained of præcordial pains on any slight exertion, followed by palpitation, dyspnœa and syncope. Excessive palpitation in the sternal notch, with a feeling of suffocation. Most of the cardiac sounds transposed much below the usual zone, and on a line with the epigastrium and below it. Digestion much impaired, and low-spirited very generally. It was an incurable case, of course, and would only serve to point out the sphere of usefulness of *cereus grandiflorus* in mitigating the severe paroxysms. I gave her:

℞ Tinct. cereus grandiflorus, ℥ j.

Sig. Take ten drops every four hours in a little water.

"July 8th.—Patient says that the severity of all of her bad symptoms was much ameliorated since taking the medicine. The principal source of trouble to her now was from dyspnœa (probably œdema of the lungs), following any trivial exertion. Yet a better appetite was established from the time this medicine was used, and that melancholy disposition which hung like a pall over her mind, yielded to the better established feeling of harmony between that diseased body and mind. I heard subsequently that while under the influence of this medicine she felt tolerably easy, thereby proving its good effects in grave lesions of cardiac disease."

The cactus grandiflorus is the Nightly Blooming Cereus, one of the most beautiful of our cultivated flowers. O'Hara, in the Medical News (1884) publishes some striking testimony to the value of cactus in dilatation of the heart and in other organic or functional conditions involving failure of heart power. He concludes "that it is a pure cardiac tonic, whether for functional or organic disturbances, especially in cases of regurgitant disease."

The two above mentioned extra officinal remedies seem to be of about equal therapeutic power. Though much in use among American practitioners, it cannot be said that they have as yet won a definite place in the Materia Medica, and they are rather to be used as succedanea to the other cardiac tonics whose action is better known, and (probably) more certain.]

CEREUS BONPLANDII.

The following is an extract from I. J. M. Goss' Materia Medica, just published at St. Louis, Mo.: "Cereus Bonplandii is a species of the cactus, discovered some years ago by Bonpland in Central America, and is now also found in Mexico. This remedy is one of the best that I have found to mitigate the symptoms of hypertrophy and dilatation, and also a good remedy to quiet the irritability in valvular disease of the heart. It, like the cactus grandiflorus, has a specific affinity for the heart, and quells any undue excitement of that organ. I have given it in many cases of heart disease, and though it does not possess the power to cure a bad case of hypertrophy, or dilatation, yet it quiets the heart and controls any undue excitement of that organ. In nervous or sympathetic palpitation, which is so frequently associated with female diseases, the Bonplandii acts with great promptitude and certainty. I was called a few days ago to see a lady who was so troubled at night with dyspnœa and palpitation that she could not sleep. On examination I found the heart beating very forcibly, at the rate of 90 or 100 beats per minute.

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I put her upon the Bonplandii for her heart troubles, and proper treatment for the induration of the uterus, and she was soon relieved of her heart difficulties, and now sleeps soundly without any trouble from palpitation or dyspnœa.

"A lady about 28 years of age, barren, but married for several years, consulted me for palpitation and great dyspnœa at night. On examination I found the heart beating with unusual force, and at the rate of 90 or 100 per minute. I put her upon the tincture of Bonplandii, which gave relief in a short time, and she appears to be recovering her health entirely. In this case there appeared to be no lesion of the uterus whatever, but simply an irritable heart, and the above are but two of the many cases that I am now treating with this new remedy, and they all seem to be very readily influenced by it. * * * * *
It acts like cactus grandiflorus, but seems to be more powerful in its action. It is destined to become one of the most reliable heart remedies. It is much safer than digitalis and equally as reliable."

Dr. R. E. Kunze in New Preparations, April, 1879, thus sums up the remedial cardiac properties of Cereus Bonplandii, which he was the first to introduce to the profession:

"The properties of Cereus Bonplandii may be summed up to be those of a cardiac stimulant and nerve sedative. The feeble heart so often met with in anæmic conditions is stimulated to the normal activity, and the irritable, overtaxed organ again restored to its equilibrium by the indirect action this remedy exerts in controlling excitability of the cardiac nerve centres. This enables the physician to use this drug to advantage in both functional and organic affections of the heart."

CHAPTER III.

NEW METHODS OF TREATING STOMACH DISEASES.

GENTLEMEN: There is no department of pathology which has been more favorably influenced by therapeutics than that which pertains to diseases of the stomach, and I desire on this occasion to bring before your notice three curative measures, which I deem of the greatest importance, and which seem to have revolutionized the treatment of gastric affections; these are of surgical nature and are comprehended under the heads: lavage, or washing out the stomach; gavage, or forced feeding, and the use of meat powders in the alimentation of the sick.

Encouraged by the success which the antiseptic method has given in operations practised on the abdomen, surgeons have sought to effect active intervention in the disorders of the stomach, and have successively proposed *gastrotomy*, *gastrostomy*, and *gastrectomy*. I cannot give you here a complete account of these three operations, so I shall only point out their chief indications.

Gastrotomy consists, as you know, in opening the stomach, and this operation has been performed of late especially in order to remove from the cavity of that organ foreign bodies, and you are familiar with the interesting cases of Labbé and Felizet. It has also been lately proposed to practice this operation in order to penetrate the stomach and gain access to the pylorus, for the purpose of dilating it with the fingers, and thus overcoming fibroid thickenings of this orifice or cicatricial bands causing stricture. This digital dilatation has never been performed in France, and the most serious objection which can be made against it, is the difficulty of accurately diagnosticating beforehand the pathological condition requiring the operation.

The same objection may be made to gastrectomy, as applied to treatment of affections of the stomach, and to the difficulties of an operation which consists in removing a portion of the stomach and making a new pylorus, we must add the equal difficulty of correctly determining the nature of the malady, for in the great majority of cases we find it impossible to attain to certainty respecting the limits of the tumor which we would like to resect, and to know if there are not other tumors like it in other parts of the abdomen; therefore gastrectomy, practised for the first time by Pean, and since then repeated so frequently in Germany, has seldom resulted in anything but failure, and to-day seems completely abandoned.

Gastrostomy, which is the establishment of a permanent opening in the walls of the stomach, is a much more rational operation, and has in numerous cases been attended with success. Gastrostomy may be performed under two different circumstances: when there exists a stricture of the œsophagus and of the cardiac orifice, or when there is an obstruction at the pylorus. In strictures of the œsophagus, and when this tube becomes impermeable, gastrostomy is urgently demanded, and it is apparent that by means of this kind, one may succeed in supporting the life of the patient by a gastric fistula. The curious observation of Prof. Verneuil, respecting Marcelin, shows us the advantages which may be derived from this operation. If, moreover, in fibroid stricture it does not always give us equally good results, it is because the operation was too long put off, and the patient worn out by prolonged abstinence was unable to resist a severe surgical traumatism.

I believe gastrostomy perfectly indicated in cases of cancer of the cardia and of the œsophagus. There are, in fact, cancerous affections which become grave, not by the extent of their invasion, but because they constitute an insurmountable obstacle to the regular functions of organs indispensable to life. A cancer of very small dimensions situated at the pylorus or cardia occasions death by starvation, and it is easy to understand that one may be able to prolong the life of patients for months, or even years, by creating a new passage for the introduction of food.

When the obstacle is seated at the pylorus, surgical intervention of a different character is required, and gastrostomy in this case consists in establishing a new orifice for the stomach, which shall open not externally, but into another part of the intestine. Surmay, of Ham, has advised to make the opening into the duodenum, and he has performed this operation in my service on a young woman 24 years of age, affected with cancer of the pylorus. The operation proposed by Billroth seems to me to constitute a notable advance on the preceding.

This operation consists in attaching a loop of intestine nearest the duodenum to the wall of the stomach, and in establishing there a communication between the two cavities, so that the stomach shall open into the intestine by a new pylorus. This operation does not involve the risk of loss of those fluids so necessary to intestinal digestion, the bile and pancreatic juice, which continue to flow into the upper part of the intestine. This is the operation which you ought to perform whenever there exists an obstacle at the pylorus effecting, or nearly effecting, closure, and for my part I have very much regretted that I did not resort to it in two cases where I had diagnosticated non-malignant stricture of the pylorus; the autopsy having shown my diagnosis to be true. I believe, moreover, that in certain forms of cancer of the pylorus, without any cachectic symptoms, this operation is indicated; for, leaving intact the tumor, it does not involve the grave risks of gastrectomy. Unfortunately, as in stricture of the œsophagus, we do not propose this surgical procedure except in the last stages of the disease, when the vital powers are low and the patient is ill able to withstand the sequels of the operation.

Lavage of the stomach has accomplished as wonderful results in the treatment of gastric affections as surgical intervention, and although opposed to this new method formerly, as you may see by the first edition of my "Clinical Therapeutics," I have seen reason to change my mind; you can, in fact, see every day in my hospital service, instances of the good effects which we obtain from washing out the stomach in diseases of that viscus.

It must not be supposed that this lavation in its essential particulars is new; it was even proposed as far back as 1832 by a French physician, Blaton, who recommended washing out the stomach in chronic gastritis; but it is to Kussmaul, in 1867, that we are principally indebted for practical details as to the easy performance, the indications and contra-indications of the operation. The stomach syphon has contributed to render this practice current. It has been claimed that in 1829 Arnolt employed a soft rubber tube, and applied the theory of the syphon to the removal of the contents of the stomach. But it is to Oser, of Vienna, and Fauché, of Paris, that we owe the real discovery of siphonage, and it is since the communication of the latter to the Academy of Medicine in 1879, and his subsequent publications, that the method of Kussmaul has come into general use in France.

I need not describe here this stomach tube, with which you are all acquainted. I will only mention the useful improvements wnich Debove and Galante have made in the syphon, in giving to the part which penetrates the stomach more stiffness, while at the same time preserving its suppleness. I advise you always to commence your attempts at lavage with the tube of Debove, of which the introduction is very easy, since without the help of the patient you can make it pass down to the stomach, by successive impulsions. Then when the œsophagus and stomach are habituated to the presence of this foreign body, you can make use of the ordinary syphon, which demands for its introduction efforts of deglutition on the part of the patient. It will be well for you to make your patient take bromide of potassium for two or three days before the first attempt to wash out the stomach; you will thus obtain anæsthesia of the isthmus of the fauces, and diminish the reflexes which the introduction of the tube produces.

You should, moreover, not forget that in the passage of the tube the most painful sensation to the patient is that of respiratory embarassment, hence it would be well to recommend him to take as full breaths as possible. It is hardly necessary that I should describe minutely the manual manœuvers in the introduction of the tube; you are already familiar with them. You fill your tunnel with the liquid designed for the lavage, then you elevate it, and when the liquid begins to disappear, you immediately lower it. Often foreign particles stop up the orifice of the syphon. To get rid of them, you may make use of two means. Either you may make the patient cough, which causes the liquid to flow more freely, or you may start anew the suction action of the syphon by pouring in a certain quantity of water. I pass now to the different liquids which you may employ in the performance of lavage, and which constitute, so to speak, certain dressings for the mucous membrane.

For simple lavation you may make use of bicarbonate of soda water, or a solution of sulphate of soda. In the greater number of cases it is water artificially charged with one drachm of soda bicarbonate to the quart of water that is used. The Germans seem to show a preference for the sulphate of soda, and you can employ a solution of this salt in the proportion of a drachm and a half to a quart of water in cases where very obstinate constipation complicates the stomach affection. You can also utilize the natural mineral waters, such as those of Vichy and Chatel-Guyon, for instance. When the contents of the stomach give indications of having undergone putrid fermentation, you can use with profit the various antiseptic solutions.

Andeer, who introduced resorcin into therapeutics, has proposed in these cases to wash out the stomach with one-per-cent. solutions of this disinfectant, and I have myself often resorted to this antiseptic method, which has certain advantages, but is not without its disadvantages; I refer especially to the danger which is likely to result from absorption of this medicament when it is not all removed from the stomach by the syphon. Therefore, I much prefer boracic acid to resorcin, and I make my "lavages" with a one-per-cent. solution of this acid and find that it disinfects the contents of the stomach perfectly well and may be absorbed without any bad effects. You can also use in cases of putrid dyspepsia Belloc's charcoal powder, and make your lavation with water containing from two to four tablespoonfuls of this wood charcoal.

When the matters returned by the syphon contain a certain quantity of digested blood, as happens in cases of ulcerous gastritis, you can perform the "lavage" with a solution of perchloride of iron of about the strength of a tablespoonful of the officinal liquor to a quart of water.

In fine, when there exist severe gastric pains, you can employ with advantage in your lavations solutions of bismuth, of chloroform water, or water containing a minute proportion of sulphide of carbon. The solution of bismuth which I have described under the name of "milk of bismuth" contains two tablespoonfuls of sub-nitrate of bismuth in a pint of water; this solution is introduced by means of the flexible tube of Fauché. But instead of withdrawing the mixture immediately by the stomach tube, you wait three or four minutes so that the sub-nitrate of bismuth may deposit itself on the mucous membrane of the stomach. Then you syphon out the remainder of the liquid.

Chloroform water is a new medicinal agent which we owe to Regnault and Lasègue. Nothing is more simple than the preparation of this chloroform water. You take a flask of the capacity of a quart; you fill it three-fourths full of water and add an indeterminate quantity of chloroform; you shake it several times, then you decant it with care so as to leave behind all the chloroform which is deposited. The solution which you thus obtain, and which keeps a strong odor of chloroform, is called "saturated chloroform water," and to make use of it for medicinal purposes you dilute it with an equal quantity of water. The patient should be made to take of this mixture a tablespoonful, morning, noon and evening. It is very easy to medicate this chloroform water with other substances introduced to serve certain indications; thus diffusible stimulants may be added, such as ammonia, peppermint, lavender, or a more decided sedative action may be obtained by the addition of some of the narcotics.

In cases of gastralgia, or simple pain in the stomach, this chloroform water so prepared may give excellent results when taken by the mouth instead of by the stomach tube. If you employ it in the form of lavage in cases of acute pain, or intolerance of the stomach, you can make your solution with two teaspoonfuls of the saturated chloroform water to the quart of liquid.

Chloroform water is calmative and antiseptic, but these two properties are still more marked in the solution which I have denominated.

CARBON DISULPHIDE WATER.

This water has for its base, the disulphide of carbon. Kiandi Bey has shown the innocuousness of this substance, which Delpech considered as eminently toxic, and he has proved its high antiseptic power, and my excellent interne, Sapelier, who is devoting his inaugural thesis to the study of disulphide of carbon, has demonstrated by experiments on animals that the view of M. Kiandi is correct, and that you may give 20, 30, or 40 centigrammes of this sulphuretted preparation to dogs without any danger.

The water of carbon disulphide is prepared like chloroform water, by agitating water containing a small quantity of the substance and decanting the liquid; the most of the sulphide of carbon is deposited on the bottom of the vessel, and is easily left behind during decantation. The water has a slight odor of fermented cabbage, which somewhat resembles that of chloroform. It contains a little more than one gramme of carbon disulphide to the quart of water. We give it diluted with an equal quantity of water, or with wine and water.

This mixture has no disagreeable taste or smell, and we give of it four, five, and even six tablespoonfuls at a time. This water soothes pains in the stomach and arrests putrid fermentations, and we apply it, not only to the treatment of the dilatation of the stomach, but also internally in typhoid fever. (We shall return to this again in the next lecture on new intestinal medications.)

You can also make use of this carbon disulphide water in "lavage" of the stomach, and employ for this purpose a solution containing one-third of this liquid and two-thirds of pure water.

You know already the operative manœuvers in the performance of "lavage;" you know also the solutions which are in common use in washing out and in medicating the stomach; it remains for me now to indicate the temperature and the quantity of the liquids to employ, and the time for making these lavages.

I am in the habit of using liquids at the temperature of the surrounding atmosphere; there is, however, a little risk in employing fluids at too low a temperature, and we had in our hospital wards one unfortunate case of pulmonary inflammation, resulting from the introduction of too great a quantity of cold water by the stomach tube; consequently I advise you to use water from which the chill has been taken, especially if you intend to introduce a large amount into the stomach. With regard to the quantity of liquid, there is no invariable rule, and you ought, when you can, to prolong the lavage till the water which flows out is as clear as that which enters, or nearly so. Even here, however, there are differences depending on the greater or less tolerance of stomachs, and while some can support large quantities of water, others vomit when the water introduced exceeds a certain amount, which is sometimes very small.

You ought always to perform the lavage when the patient is fasting, and the time which seems to me the most favorable is the hour of rising in the morning; Leube, however, would have it performed the latter part of the afternoon.

Generally one lavage a day is sufficient, and it is only exceptionally that you need to have recourse to it twice a day. Moreover, the abuse of these lavations is not without risk; the patients are fatigued, the peptonization of food is prevented, and sometimes the lavage becomes the irritant cause of contractures, which in one case, which I had last year under observation in the Hospital St. Antoine, took on a character of such gravity that the patient succumbed.* Thus far I have only spoken to you of the syphon, and before entering on the study of the indications and contra-indications for this method, I

* Dujardin-Beaumetz and Œttinger, Note on a case of Dilatation of the Stomach, Complicated with Generalized Tetany (Soc. Med. des Hôp, 26th Oct., 1883).

ought to say a word about other instruments in common use.

The stomach pump has been employed by Kussmaul, and I have myself made great use of it, and my pupil, Dr. Lafage, of Neuilly, has reported in his thesis a large number of cases where the stomach pump was employed. But since then I have more and more abandoned the pump, and believe that in the great majority of cases the syphon suffices. I here show you, however, the stomach sound with double current, invented by Audhoui, and I call your attention to the new apparatus of Boisseau du Rocher, which, based on the same principle as the double current tube, has for its object to establish a current in the interior of the stomach. I do not know whether these instruments are often employed, and for my part I have never had recourse to them.

In what cases ought you to practice lavage of the stomach? There is a formal indication for these lavations whenever the stomach is dilated, whatever may be the cause of this dilatation. You know that dilatation of the stomach depends chiefly on three causes; either on a mechanical obstacle at the pylorus, as cancer or a cicatricial band, or an inflammation of the walls of the stomach which involves the muscular layer and paralyzes it (a morbid condition which almost always attends the prolonged gastritis of drunkards); or, lastly, it depends upon a peculiar state of the nervous system entailing paralysis, and the mechanism of which is unkown to us,—this kind of dilatation is seen in neuropathies, such as hysteria.

You know also the important pathogenic rôle which Prof. Bouchard has assigned to this dilatation of the stomach, which he considers as the initial cause of a great number of secondary affections. In all these cases lavage of the stomach will give you durable and permanent results when there are no incurable lesions, and a temporary benefit when you have to do with incurable lesions. In ridding the stomach of the liquids which embarrass it, in opposing the putrid fermentations which the prolonged sojourn of these liquids determines, and which have a considerable part (as I shall tell you in the next lecture) in the morbid symptoms which Prof. Bouchard has described under the name of stercoræmia, in stimulating the contraction of the muscular fibres, and finally in enabling you to medicate the mucous membrane of the stomach, lavage will give you astonishing results.

There has been considerable discussion as to whether one should practise lavage in cases of ulcer of the stomach. Here we ought to distinguish two different conditions; when you have to do only with simple erosions of the mucous membrane which give a black discoloration to the vomited matters, as is frequently the case in the gastritis of hard drinkers, lavage is indicated; when, however, you have to treat the round ulcer (ulcus-rotundum, of Cruveilhier) so frequently the cause of large hæmatemeses, you

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In an interesting comparative study of the different meat powders, Yvon has shown that almost all contain an equal quantity of available nitrogen, viz: about 13 to 14 per cent. To remove the prejudicial odor which distinguishes these meat powders, especially when under decomposition, various processes have been tried. Rousseau washes them with alcohol, which frees them from fatty substances, and thus retards putrefaction; Yvon first cooks the meat a little, and he has shown that cooking does not in the least deprive the meat of its nutritive properties; Tanret prepares his meat powder in a similar way. But many persons prefer to make their own meat powder, and if you should be of their number, you can extemporize a good preparation in the following way: Take a certain quantity of boiled meat, cut it up in little pieces and dry it thoroughly by a water bath. Then grind the desiccated product in a coffee mill, of which the teeth are made to approximate as closely as possible. You thus get a powder which is somewhat coarser than that made by the pharmaceutical houses, but of an agreeable taste and which answers the purpose very well.

The meat powders of commerce ought to show muscular fibres under the microscope; they ought also to undergo peptonization with great facility. This peptonization, according to Yvon, corresponds to 70 or 74 per ct. of the weight of the powder.

Leaving to one side what pertains to the usage of these powders in super-alimentation I shall concern myself here only with their application to gastric and intestinal affections.

Whenever practitioners are in the habit of recommending raw meat as a restorative (and this valuable nutrient has been in great vogue everywhere since its uses were first pointed out by Weiss, of St. Petersburg), they should now substitute meat powders, the superior advantages of which are as follows: greater nutritive value, the powder of meat corresponding to five times its weight of raw meat; much more ready peptonization by reason of the pulverulent state; lastly, freedom from the danger of tænia, an evil which has often attended the ingestion of raw meats.

We have at various times attempted to mix divers farinas, as pea-flour, rice-flower, Indian meal, with our meat powder; to-day these mixtures are pretty generally abandoned, as broths made in this way when taken hot have a very disagreeable odor, and it is found that the meat powder is much less offensive when administered cold. I am much in the habit of giving this nutritive powder in the form of milk punch, stirring two tablespoonfuls of meat powder into a pint of old rum and milk, or whisky and milk (any good liquor can be substituted for the rum or whiskey, and the quantity of the spirits can be varied at pleasure); the whole may be taken at once or at several draughts. This meat grog is especially applicable to the treatment of pulmonary tuberculosis;

in affections of the stomach you ought to use it sparingly on account of the alcohol in it. In gastric affections you may give the powder in plain milk or milk sweetened and flavored with vanilla, or you may give it in chocolate or prepared cocoa.

Lastly, when you use the stomach tube to practise "gavage" it will be sufficient to mix the meat powder directly with milk, but you should have care always to pour in a little milk at the end of the operation, in order to clear the tube of any meat particles which may cling to its sides, to be left in the pharynx on withdrawal of the sound, and to annoy the patient by their disagreeable taste. I always make it a point to terminate each "lavage" by a "gavage" of milk and meat powder, and I have always obtained good results from this practice. This meat powder will not only render you service in cases of dyspepsia with anorexia, and in connection with your local medications of the gastric mucous membrane, but also in the treatment of diarrhœa, as we shall see in the next lecture when I come to speak of the new modes of treating intestinal diseases.

APPENDIX TO CHAPTER III.

LAVAGE AND GAVAGE.

The operation of lavage of the stomach is coming into general use in diseases of that organ attended with dilatation and putrid dyspepsia, where frequent cleansing and disinfection of the gastric cavity is indicated. Gavage, or forced feeding, which is also performed by the œsophageal tube, gives brilliant results in phthisical cases and certain anæmic conditions, where it is impossible sufficiently to nourish the patient by mouth, but where food of a proper kind when introduced into the stomach is well digested and assimilated. This is an operation which is now frequently performed in all the large hospitals, which are provided with stomach syphons, Debove tubes, etc., for the purpose. Many a private practitioner has also made "lavage and gavage" a part of his armament by which he combats disease.

The following extract from the work on "Diseases of the Stomach and Intestines" by Dujardin-Beaumetz, published by Wm. Wood & Co. (Library Series, 1886, translated by E. P. Hurd) gives a more particular account of "lavage and gavage" of the stomach:

"The idea of removing liquids from the stomach is of French origin, and must be credited to Casimir

Renault. Another Frenchman, Blatin, in 1832, taught the utility of washings of the stomach. It must be admitted, however, that it was Küssmaul who first systematized this practice and gave it a definite place among the resources of our profession.

"It was in 1867 before the Congress of German physicians held at Frankfort on the Main, that Küssmaul first made known the results of his clinical experiments with the stomach tube. He employed the œsophageal sound, to which he adapted a suction and force syringe, and it was by virtue of this apparatus, called stomach pump, that liquids were injected into or withdrawn from the stomach. The inconveniences of this instrument were these: the introduction of a rigid tube was painful, moreover, the extremity of the sound irritated the walls of the stomach, so after several trials of Küssmaul's pump, I abandoned this method. But the discovery which Faucher made in 1879, and almost at the same time, Oser, in Germany, removed these difficulties.

"This discovery consisted in the passage of a soft and flexible tube into the cavity of the stomach, and in the application of the physicial theory of the syphon to the introduction into and removal of liquids from this organ. From this date I have multiplied the applications of the stomach syphon, and one of my pupils, Dr. Joseph Lafage, has comprised in his excellent thesis on the treatment of dilatation of the stomach by "lavage," a great number of observations, and for ten years past I have so frequently practised stomach-washing, and with so much success, that I have had reason to felicitate myself for the part which I have taken.

"How is lavage of the stomach performed? The answer to this question involves a description of the instrument used, the manner of using it, and the liquids employed for cleansing the stomach.

"The tube Faucher is of flexible caoutchouc, one metre and a half long, with an index on one side, so that you may know the depth in centimetres to which the tube has penetrated. The tubes are of three sizes, No. 1, 2 and 3, the diameter of the first being eight millimetres, the second, ten millimetres, the third, twelve millimetres; to these tubes is attached a funnel.

"In purchasing a tube Faucher, you should select one as smooth as possible and with some degree of stiffness, so that you may easily be able to make it enter the stomach by successive pushes (such tubes as Debove has recently caused to be made); as for the funnel, it should be of glass, so that you may watch the descent of the liquid.

"These tubes have lately undergone great improvements, without yet fully attaining the ideal of a hollow and resisting, yet quite supple tube. One of my colleagues, Audhoui, has constructed a stomach tube on the principle of the double catheter, (two flexible syphons glued together), while my friend Debove makes two parts of the syphon, and introduces the œsophageal part by the aid of a stylet, which gives stiffness and resistance to it. These improvements have not come into general use, in fact the simple tube may, by skilful management, give you all the results which you desire.

"I advise you, when you attempt for the first time to introduce the syphon, to use tube No. 1 (taking care to select one with the requisite degree of stiffness); then, when your patient is used to a tube of this size, you can easily succeed with a larger one.

"The introduction of this instrument can readily be effected in this manner: Place yourself in front of your patient. Make him open widely his mouth and protrude the tongue. Pass in the tube over the back of the tongue, and when you have the extremity well in the throat, as far as the base of the tongue, make the patient swallow, and while the movements of deglutition are being performed, push on your instrument into the œsophagus. When once you have gained the first part of the œsophagus, you can easily carry onward the tube, by a succession of pushes, and with considerable rapidity.

"Some have proposed to render the introduction of the tube easier by greasing it with oil, vaseline, or glycerine. Fatty substances leave a disagreeable taste in the mouth; I am myself in the habit of simply dipping the tube in Vichy water, or what is better still, in milk.

"As soon as you have made the tube penetrate to the proper depth, as indicated by the salient index on the outside of the syphon, you annex the funnel, fill it rapidly with liquid; then as soon as you see the liquid disappear in the inferior portion of the funnel, you lower it instantly, converting the tube into a syphon, and causing the liquid contents of the stomach to flow into the pail which you have placed between the feet of the patient.

"During the introduction of the tube some dyspnœa is manifested on the part of the patient. The eyes are injected, the face turns red, and the patient pretends that he cannot breathe. Insist, then, on the patient making full respiration during the operation.

"To the dyspnœa we must add nausea and vomiting among the unpleasant accompaniments of the operation; this nausea is manifested as soon as the tube enters the œsophagus, or when it reaches the stomach. In some very sensitive individuals it is impossible to penetrate to the back of the throat without inducing vomiting. You can readily calm these reflexes by bromide of potassium; in fact, it is my custom to give bromide internally, and apply it locally three or four days before attempting the first lavage of the stomach.

"It is more difficult to avoid the irritation provoked by the presence of the tube in the stomach. The vomiting, however, which ensues from this cause, is more infrequent and can generally be prevented by introducing immediately into the gastric cavity a little water. In this way you will separate the walls of the stomach from the end of the tube and will avoid irritating the organ.

"The tolerance of the pharynx, of the œsophagus, and of the stomach is readily obtained, and I can affirm that always after three or four sittings, patients support without any inconvenience the presence of the tube. In a very short time they can effect the introduction of the tube themselves, and in the case of the greater part of my patients, both in private practice and in the hospital, I leave to the patient himself, after the fourth sitting, the entire performance of the operation.

"At the same time there are two circumstances which often present an insurmountable obstacle to the introduction of the syphon. These are, first of all, œsophageal spasms in certain hysterical females, spasms which it is often difficult to overcome, even with a rigid instrument; secondly, ulcerations of the epiglottis and the posterior part of the larynx, which frequently render the passage of the tube very painful. With the exception of cases of this sort and such mechanical obstacles as cancer of the œsophagus, I have never found patients rebellious to the introduction of the Faucher tube.

"What kind of liquids and what quantities is it advisable to introduce? Ordinarily we make use of some alkaline water, such as Vichy, or Vals; or it may be plain water, with one-half drachm to the quart of bicarbonate soda. I sometimes use, after the German practice, water containing one and one-half drachms to the quart of Glauber's salt.

"In certain cases it is necessary not only to wash out the stomach, but also to disinfect it. In other cases it is necessary to alleviate cramps and pain seated in the stomach; in still other cases there are hemorrhagic tendencies to combat; hence different medicated solutions are indicated.

"Among the antiseptic liquids I particularize resorcin and boracic acid. Andeer is very fond of resorcin, and I have myself made numerous trials of this medicinal agent in chronic gastritis. Solutions of resorcin, as dilute as one per cent., are irritating, but they procure a complete disinfection of the contents of the stomach; therefore in using this medicament I take care to make the solution very weak (*i. e.*, not more than five grammes to the quart). Boracic acid in the same proportion is also an excellent disinfectant.

For the pain in the stomach the best solution to employ is the milk of bismuth. To a pint of water add five drachms of the sub-nitrate of bismuth; stir constantly before introducing this mixture into the stomach, and when you have caused it to enter the gastric cavity, let it remain there for several minutes, that the bismuth may have time to become deposited in thin layers over the mucous membrane. To the milk of bismuth you may add chloroform water and the carbon bisulphide water, solutions which are markedly anæsthetic to the gastric mucous membrane. As for the hæmorrhages, the best remedy with which to combat them is a weak solution of perchloride of iron; a tablespoonful of the liquor fer. perchlorid. to the quart of water. All these constitute the topical applications or "dressings" on which you can best rely.

As for the quantity of liquid to use, this depends on the degree of dilatation and on the tolerance of the stomach. Some patients will bear two, three, four, and even five quarts; in the case of others a pint even will induce efforts at vomiting. You will then have to determine by trial the quantity which the patient will tolerate. However sensitive may be the patient's stomach, it is a good rule to continue the washing process, till the liquid which issues from the buccal end of the syphon is perfectly limpid and clear.

There is generally little difficulty attending the removal of liquid by the syphon; it is possible, however, that some solid particles of food in the stomach may get impacted in the eyes of the instrument so as to stop them up. You can generally clear these out by letting a little more liquid run through the tube into the stomach. In other cases (especially where there is great dilatation) your tube may bend on itself so that its lower extremity is applied to the upper part of the stomach; this may happen in ordinary practice from having introduced the sound too deeply. In these circumstances the syphon fails to work, for obvious reasons. You have only to withdraw the tube a few inches to overcome the bend and bring the open end in contact with the liquid. You can aid the evacuation of the stomach by pressure over the abdomen, and by making the patient cough, thus obtaining the expulsory contractions of the diaphragm.

Is the syphon sufficient in all cases of dilatation of the stomach? Yes, in the immense majority of cases. When, however, the dilatation is enormous, and the stomach is full of putrid liquids, as sometimes happens in cancer of the pylorus, it is necessary, in order to effect thorough cleansing, to employ the stomach pump, which injects the detergent solution with more force, and enables it better to reach all parts of the stomach. I am in the habit of using the Collin pump in these circumstances, which is a good aspirating and force syringe, and is easy of adjustment.

To wash out the stomach and disinfect its contents, to apply suitable medicated dressings—such are the results which you may obtain from the syphon. But this is not all. You can by this method feed the patient, and practice what Debove calls superalimentation, what Mesnet has denominated artificial alimentation, and what I designate under the common-place term, "*gavage*" (force-feeding).

It was Debove who first conceived the happy idea of applying the tube of Faucher to the alimentation of patients. The results which we have together obtained have stimulated us to continue our first essays, and since the first communication of Debove, in November, 1881, to the Medical Society of the Hospitals, this method has continued to undergo improvements.

Debove was the first one, moreover, to make use of meat in the form of powder in this forced alimentation, and to obtain good results from this practice. Formerly we employed a mixture of raw meat and eggs, beat up in milk, but despite all the care that was taken in mincing this raw meat, the mixture was far from being homogeneous, and quite often particles of meat in suspension would stop up the tube, and prevent the further descent of the liquid food; and it was found necessary in these cases to use tubes of pretty large diameter. At the present day we get rid of these inconveniences by using alimentary powders.

Of what do these powders consist? They are of two kinds: powdered meat and farinaceous substances cooked and reduced to a fine powder. The powder of meat is obtained by drying the minced fibre of meat and raising the temperature to 100° C.; then reducing it to an extremely fine powder. At the present time, since our communications on the subject, a great number of manufacturers fabricate these meat powders, and you will find them in commerce under the denomination of powders of pure meat and powders of the fillet of beef. The first, which are composed of horse flesh (a kind of meat, by the way, very nourishing), are of gray color, and their odor recalls that of duck's liver; these are the least expensive. The second, whose price is much higher, for it takes six kilogrammes of fresh meat to obtain one of the powder, are of reddish color, and have the odor of roast beef. Both are reduced to an almost impalpable powder, and it is this very finely pulverized condition which, by enabling each molecule of meat to be attacked on all sides by the gastric juice, explains to us how it has been possible with this method to cause such enormous quantities of these powders to be absorbed. We find in this fact a direct illustration of what I said to you in one of my previous chapters, in reference to the influence of the molecular state of bodies on their digestibility. We find also here another confirmation of the experiments of Schiff, which go to show that meat is one of the best peptogenous substances; in fact, under the influence of these powders of meat, you will see stomachs the most inactive and feeble recover their functions and the appetite return.

The farinaceous powder consists of lentils, which furnish a flour of a very nourishing and highly azotized character. These farinas were originally used in their raw state, then Debove, having found that cooking augments their digestive properties, caused them to be cooked before being reduced to powder, and it is under this form of farina of cooked lentils that we generally administer it.

Tanret has advised to cause the lentils to germinate before using them, and Perret has made the powder out of malted lentils. Germination, in fact, favors in part the transformation of starchy matters, and in this way aids their digestion. You can in the same way utilize the farina of Indian corn, which is very rich in fatty materials, and the mixture of this powder with the powder of meat, either in equal proportions or of two parts of meat to one of farina, constitutes an alimentary product very acceptable to even the most fastidious patients.

These powders may be mixed in a variety of ways, as may be seen by consulting the thesis of my pupil, Robin.

In practising forced feeding these alimentary powders are incorporated with water or milk, in the proportion of about 200 grammes (between six and seven ounces) to a quart of the vehicle. In mixing the ingredients, be careful to add the milk little by little, so as to make first of all a homogeneous paste with the powder, which slowly undergoes a solution in the milk as it is added, and you get in this way a liquid having the consistence and the aspect of chocolate, and which is ready for use.

You see, then, the advantages which these meat powders have over the older preparations made from raw meat; they are much more nourishing in a smaller volume, and much more digestible, and there is no danger of conveying tænia through them to your patient. They are useful dietetic agents when stirred in thin tapioca gruel, or broth; one or two spoonfuls of powder of cooked beef, and a spoonful of farina of lentils, cooked or malted, or if you please torrefied corn meal. Gruels made in this way are very agreeable to the taste, and are well borne.

These are not the only advantages of these powders. They have enabled me to simplify very much the operative procedure when it is desired only to practise artificial feeding, and when washing out the stomach may be omitted. We see, in fact, that while in the case of patients affected with severe gastric disorders, little or no opposition is made to the introduction of the tube Faucher, it is not so with persons not suffering from profound troubles of the digestion, but in whose case forced alimentation is deemed necessary. They are apt to be frightened at the size and length of the syphon, and to such an extent, that thus far the method of Débove has not been popular in the private practice of physicians, however successfully it has been employed in the hospitals.

I have therefore attempted to render the operation less painful, and this is the result of my endeavor: After having verified the fact first taught by Ortille, that in order to introduce liquid substances into the stomach all that is necessary is to place them in the upper part of the œsophagus, I have considerably shortened the tube Faucher, and I have given it a length only of twenty centimetres. Then since the alimentary mixture made with meat and farina is thin and diffluent enough to traverse quite narrow tubes, I have diminished considerably the diameter of the tube, which is now only about the size of a large sized urethral sound. Lastly, I have flattened the pharyngeal extremity of the tube so as to render its introduction easier. A whalebone stylet keeps the tube curved, and a large disk placed at the buccal orifice (to keep the patient from swallowing the tube) completes the first part of the apparatus. The second part consists of a glass jar, in which I place the alimentary mixture, in the upper part of which reservoir air may be compressed by means of an India-rubber ball; a long India-rubber tube connects the œsophageal part of the instrument with the glass jar.

You proceed in this manner: With the œsophageal sound, furnished with its stylet, in your hand, you make your patient open widely his mouth, putting out his tongue, as if for a laryngoscopic examination; with the right hand you introduce the tube into the back part of the throat, and cause your patient to execute movements of deglutition, and you withdraw the stylet, taking care that the disk which terminates the tube shall come in front of the mouth; you then place the extremity of the free tube which is attached to the glass jar, into the pharyngeal sound. Then you compress the rubber ball and the alimentary mixture passes from the reservoir into the œsophagus of the patient; you ask him to make efforts to swallow, and slowly and progressively you cause the liquid in the glass reservoir to penetrate the stomach.

You have often seen me perform this operation in our hospital; you have seen the readiness with which patients consent to be fed in this way, and how much they prefer this method to the former, in which the longer and larger tube is used.

Thanks to gavage we see the appetite return, the bodily weight increase, the strength come back, and the facts which Débove has published, and those which I have noted, indicate the great future in reserve for this kind of treatment, which is applicable to all cases where nutrition is at fault, and especially to tuberculosis."

CHAPTER IV.

NEW GASTRO-INTESTINAL MEDICATIONS.

In the last lecture I spoke of the new gastric medications. I wish now to complete the subject by telling you of the new gains made by therapeutics the last few years in the treatment of gastro-intestinal affections, and I propose to call your attention particularly to the following points: 1. The application of electricity to the treatment of diseases of the stomach and intestines. 2. To enteroclism. 3. To alimentary lavements. 4. To anæsthesia by the rectum. 5. Lastly to a new remedy said to be curative of hemorrhoids, the hamamelis virginica.

The applications of electricity to the treatment of gastro-intestinal affections have been multiplied during the last few years, and we have to consider the subject in its relation to the stomach affections on the one hand and to the intestinal on the other.

For persistent, uncontrollable vomiting and acute gastralgic pains, Apostoli, repeating the first tentatives made in 1861 by Prof. Semmola, of Naples, has proposed to employ constant currents.[1] He practises in

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[1]Apostoli: On the new treatment by electricity of the epigastric pain and the gastric troubles of hysteria (vomiting, gastralgia). Bull. de Ther., 1882 t. ciii, p. 410. Semmola, see Gubler's Journal de Therapeutique, Oct. 25th, 1878.

these cases what he calls "positive polar galvanization of one or both pneumogastric nerves. This is the mode of procedure: You place the positive electrode outside of the inner extremity of the clavicle just grazing the upper side of the bone, and over a point marked by the depression left by the interval between the two inferior fasciculated heads of the sterno-mastoid. This electrode is constituted by a beak-shaped carbon point, covered with chamois leather, which is moistened before being used. The other electrode consists of a roller which the patient holds in his hand; the battery is the Gaiffe or Trouvé apparatus with constant current.

As for the quantity or dose of electricity, this is variable, and oscillates between 5 and 15 milliamperes, and ought to be such that under its influence the epigastric pain disappears.

The duration of the séance ought to be sufficient to effect disappearance of all pain and spasm. It averages from ten to twenty minutes, but may be prolonged much beyond this. To combat the vomiting, Dr. Apostoli recommends as of prime importance to begin the galvanization when the stomach is empty, then to make the patient eat during the galvanization, and to continue the latter till all vomiting has stopped.

I have often employed this method in my hospital service and in my private practice, and I have sometimes obtained from it good results, especially in the multiple manifestations, so well described by my pupil

Dr. Lucien Deniau, in his thesis on Gastric Hysteria. Moreover, this process presents no danger, it is not complicated, and may be had recourse to without any inconvenience.

But electro-therapeutists have gone farther in this direction, and have proposed to carry the electrical current to the interior of the gastric cavity. Fürstner and Heftel, Macario and Bonnefin had already employed weak induced and intermittent currents to arouse the contractility of the stomach. Perli, in 1879, applied this induced electricity to the interior of the stomach by means of a conductor introduced in an œsophageal sound, and he counselled this faradization in the treatment of dilatation and chronic catarrh of the stomach.[1] Baldrino Bocci[2] in 1881 repeated the experiments of Perli, and always with faradic currents. Our laboratory chief, Dr. Bardet, to whom we owe an excellent treatise on Medical Electricity, uses constant currents, and practises direct galvanization of the stomach. I here place before you the instrument constructed after Bardet's plan by Galante, and which we make use of in our hospital.

It is as you see a stomach syphon tube in which, by an ingenious mechanism, is inserted an electrode constituted by a thin copper stylet ter-

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[1]Perli, el Morgagni, May, 1878.

[2]Bocci, lo Sperimentale, June, 1881.

minated at its inferior extremity by an olive shaped carbon point. This inferior extremity never passes beyond the extremity of the rubber sound, and can-

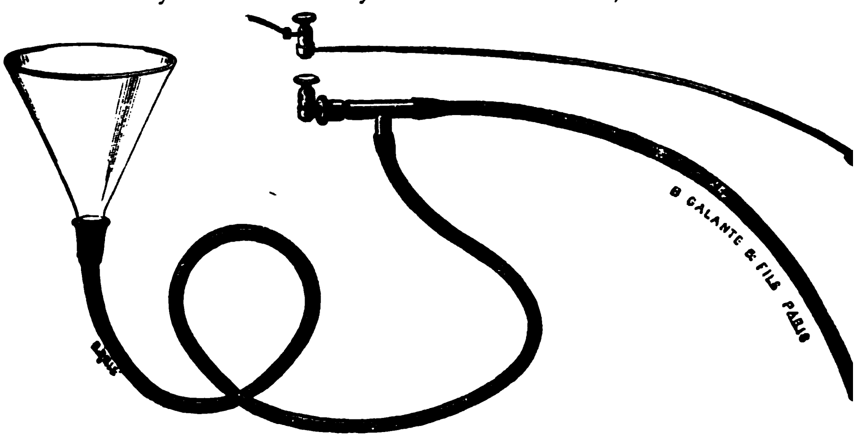

FIG. 1.

not come into direct contact with the mucous membrane of the stomach. This is the manner of procedure, and I am going to practice direct galvanization before you.

You introduce the syphon without the electrode; when once in the stomach, you pass in the stylet. You then fill the stomach with water, and lastly, place one of the electrodes either in the hand, or over the stomach of the patient, while the other is fixed to the superior extremity of the stylet. As for the current which you are to use in these cases, it varies according to the indications which you have to fulfil. If it be a case of dilatation of the stomach, and you want to stimulate the contractions of the muscular coat, it is the negative electrode which you should introduce into the stomach, and you should then make use of the galvanic current with slow interruptions; and to regulate these interruptions we employ here, as you may see, a metronome constructed for this purpose by Gaiffe. If, on the other hand, it be a case of vomiting you wish to combat, it is the positive pole which you introduce into the stomach, and you will employ constant currents.

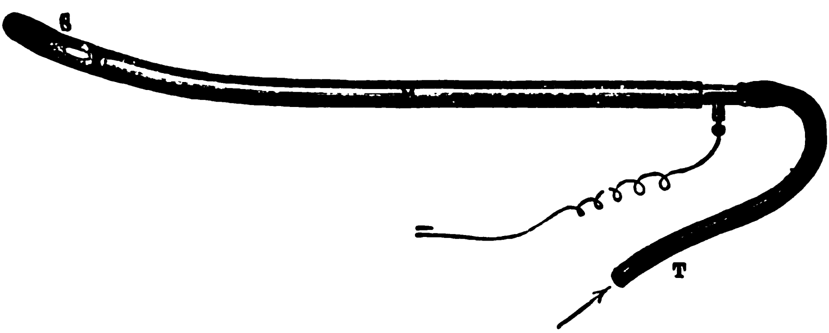

Fig. 2.

But whether you use positive or negative currents it is always by the intermediation of the water contained in the stomach that electrization of the walls of this organ is effected. As for the intensity of the current, this varies between 15 and 20 milliamperes. You have been enabled to see the benefits which are derived in certain cases of gastric ectasis or of nervous vomiting from this direct galvanization of the stomach.

But there is a morbid condition where the results obtained by electricity are still more remarkable and and more positive; I refer to intestinal occlusion. Applied for the first time by Leroy, of Etiolles, in 1826, under form of faradization, the electrical treatment of internal strangulation had been attended with considerable success, and in this connection I ought particularly to signalize the brilliant results obtained by our colleague in this hospital, Dr. Bucquoy,[1] but it is Dr. Boudet, of Paris, who still more recently (in 1880) established the mechanical basis of this application of electricity to the intestinal affection under consideration.[2]

He employs galvanization and makes use of the electrical excitator such as I here show you (Fig. 2); an excitator in which the electrode can never be in direct contact with the rectal mucosa. It is the negative pole which should be introduced into the intestine; the positive electrode should be placed over the ab-

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[1] Bucquoy, Practical Considerations on the Treatment of Intestinal Strangulation.—(Journal de Therapeutiqne de Gubler, 1878.)

[2] Boudet on "Two Cases of Intestinal Occlusion, Treated and Cured by Electricity."

dominal wall. The currents must be of feeble intensity, and must not exceed 10 to 15 milliamperes. It is necessary to be careful from time to time to interrupt the constant current by pressing upon the interrupter with which all galvanic batteries are furnished. The séances should be of variable duration, and repeated three or four times a day, according to the urgency of the case, and should last on an average of twenty to thirty minutes.

Dr. Boudet has modified the rectal excitator, and basing himself on the good results which I had attained in certain cases of intestinal strangulation by the use of the Débove tube, he has utilized in galvanizing the intestine the same apparatus which he employs in galvanizing the stomach. You see here this rectal excitator, and you readily understand its mechanism. An air cushion through which it passes enables one to keep it firmly in place.

It is especially in cases of ileus or volvulus, and in the pseudo strangulations due to paralysis of the muscular fibres of the intestine that electricity will give you the best results, while it is absolutely without efficacy when the case is one of compression of the intestine by tumors, or of strangulation by peritoneal bands.

When you have to do with strangulation by compression of the intestine, or by degeneration of that viscus,you can employ another method recommended by Cantani, of Naples, under the name of *enteroclism*. The

[redacted]

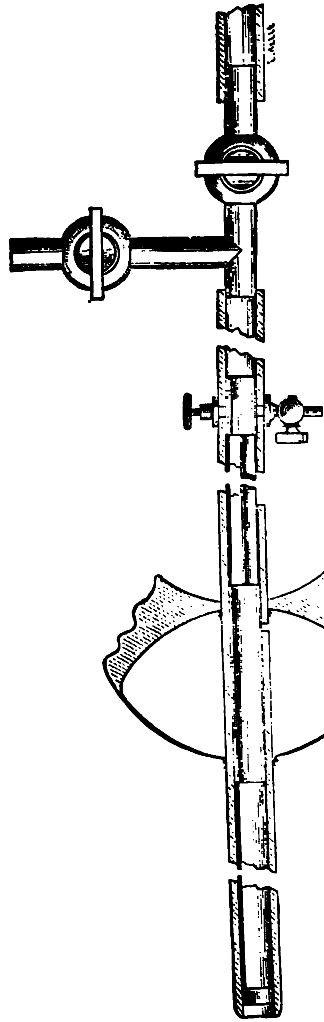

FIG 3.

apparatus which serves for the practice of enteroclism is very simple, and consists of a metallic reservoir or fountain, furnished with a stop-cock connected with a long rubber tube ending in a canula, which is placed in the rectum, and, according to the height to which you raise the fountain, you have a more or less energetic current. Cantani has maintained that one may in this way cause certain fluids, such as oil, to penetrate the whole length of the intestine, and even pass the ilio-cæcal valve, so that the oil introduced by the rectum shall be vomited by the mouth. He has utilized his method not only in the treatment of strangulation, but even in the performance of topical applications necessitated by affections of the intestinal mucosa, and Paolucci, Pera, Perli, and more recently, Muselli, have shown all the advantages of this method.*.

I have myself perfected this method by demonstrating that the best enteroclist is the Debove tube, which, owing to its suppleness as well as its rigidity, may be made to penetrate to a great height in the intestine; and, on the other hand, by means of the syphon, you are enabled to vary at will the intensity of the current by elevating or lowering the funnel. You should, however, for such purposes, select a tube whose inferior extremity is provided with but one

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* Muselli, On Enteroclism (Gaz. Med. de Bordeaux, 1883).

opening, which should be relatively small, so as to augment the force of the jet. I have been able by this means to interfere to advantage in cases of compression of the intestine by abdominal tumors, and even in cases of degenerative disease of the bowel, but you can also make good use of this method in the introduction of alimentary lavements.

This question of alimentary lavements is to-day entirely settled. We know now with a measure of exactness by the experiments of Albertoni, of Garland, of Maxwald, of Czerny, and Latschenberger, that the large intestine and its inferior extremity are destitute of all power of digestion, and that they have only a rôle of absorption, and the recent experiments of Goldschmidt have not modified this view. It is necessary, then, as I have shown, and as my pupil, Chevalier*, has pointed out in his thesis, that the lavements, to be nourishing, shall contain peptonized substances, and we have here one of the most useful applications of the peptones.

During the International Congress of Medicine held at Amsterdam, I had an opportunity to observe the manufacture of these peptones, which, owing to the labors of Saunders, are so much in use in that country. On my return, and in accordancc with my directions, M. Catillon set himself to the task, and to-

* Chevalier, On Alimentation by the Rectum, Thesè de Doctoret, 1879.

day the fabrication of peptones has become a settled branch of industry among us.

These peptones appear in commerce in two states: the one solid, and the other liquid. You should in most cases select the dry in preference to the liquid peptones; moreover, according to the method of fabrication employed, they are either acid or neutral. But whatever improvements have been made in the process of manufacture, these peptones have, nevertheless, a taste of raw glue, which render them disagreeable to take by the mouth; and, since meat powders have come into vogue, the usage of peptones by the stomach has been almost completely abandoned. They render us, on the contrary, immense service in alimentation by the rectum.

It is necessary to carry these lavements as high up as possible in the intestine, and it is here that the Debove tube, or the enteroclist instrument may render us good service. These lavements ought always to be kept up, and one should take care to cleanse the rectum by a copious injection of water before the introduction of the nutrient clyster. The following is a form of alimentary lavement which I frequently order:

Into a cup of milk stir the following substances: The yolk of one egg, two dessert spoonfuls of dry peptones, five drops of laudanum, and if the peptones are acid, add to the lavement seven or eight grains of bicarbonate of sodium; if your peptones are liquid, the quantity will be two tablespoonfuls. You will give one such lavement night and morning.

By means of these lavements you can, as Catillon and Daremberg have shown, maintain nutrition for months, on condition only that under their influence no irritation of the rectum sets in. I cannot too much recommend these peptonized lavements which constitute the only means of supporting life by the rectum.

Lastly, it has been quite recently proposed to utilize the absorbent properties of the rectal mucosa for the practice of anæsthesia, and it was Dr. Molliere, of Lyons, who introduced this new mode of anæsthesia, thus going back to a process already put in usage in 1847 by Pirogoff, of St. Petersburg, and by Simonin in 1849, who was the first to employ it in France at the Clinic of Nancy.

The method of application is very simple. In a graduated flask you place a certain quantity of ether; this flask is terminated by a rubber tube, the size of the little finger, which is introduced into the anus, and to set free the vapor of ether, it is sufficient to dip the flask into a sea-bath at 50° C. (122° F.)

Since this method of anæsthesia has been revived, we have seen it tried in France and abroad with variable results; some affirming that it is the very best method of surgical anæsthesia, others, that it is often inefficacious and even dangerous. I believe, without however being able to decide this question, which belongs rather to the domain of clinical surgery than to that of medical therapeutics, that anæsthesia by the rectum will always present this serious drawback, that it is difficult to appreciate the absorbing power of the mucous membrane of the large intestine, and that, according to variable circumstances, this absorption may be very rapid and hence very active, or very slow, and for that reason almost nil. In the first event, the absorption will be too great and may possibly entail accidents such as were observed by Dr. Delore. In the other event, on the contrary, the anæsthesia will always be incomplete, and this is what happened to several surgeons, and particularly to Dr. Follet, of Lille. However this may be, you should always have in mind the possibility of anæsthesia by the rectum in the case of certain operations, and in particular those that are practised on the face.

It remains for me to finish this short lecture by a brief consideration of a medicament very much vaunted in America and in England for the cure of hemorrhoids; I refer to the *hamamelis virginica.*

From time immemorial the native Indians of the United States have made use of a shrub that grows in abundance in marshy lands in the Eastern States and along the Mississippi, and which goes by the name of *witch-hazel.* The young shoots serve for divining rods, to indicate veins of water or of the precious metals, and in which the ignorant have faith. This shrub belongs to a botanical family to which has been given the name of *hamamelaceæ* because it bears at the same time flowers and fruit (ἅμα, at the same time, and μῆλον, fruit), and is the botanical species mentioned above.

The first mention of hamamelis is found in the dictionary of Merat and Delens, published in 1831. According to these authorities, Bollinson introduced this shrub into Europe in 1736. These facts were quite forgotten, for it is not till the last few years that the therapeutic action of hamamelis has been studied, and it is by the homœopathic physicians principally that attention was first called to the curative virtues of this plant. Thus it was Hughes in 1874, and Hale in 1879, who were the first to point out the hæmostatic and calmative action of witch-hazel.

In France it is to Dr. Serrand, in 1881, and Dr. Tyson, in 1883, that we owe the new awakening of interest in hamamelis, and I ought to mention in this connection a recent treatise on this subject, published in Belgium by Dr. Vander Espt. One of my pupils, Dr. Guy, has, moreover, devoted his inaugural thesis to the study of this plant, and you will find there embodied the researches which have been undertaken in this hospital, both in our laboratory and in our clinical wards.*

Despite the painstaking of our chemical researches and the repeated analyses of our pupil, M. Mougin, we have been unable to find any alkaloid in this plant, which seems to contain only tannin, an essential oil,

* Guy, Thèse de Paris, 1884.

a waxy matter, and divers extractive substances. As for the pharmaceutical preparations, the most popular in America and in England is a fluid extract known under the name of Pond's Extract of Witch Hazel. This preparation is nothing but a hydro-alcoholat, or spirit, having a strong and disagreeable odor; so when patients find it impossible to take this fluid extract on account of the smell, you can employ the following potion:

Take of Fl. Ext. Hamamelis,
Syrup Aurantii Corticis, āā ℥ ij.
Spts. Vanilla, gtt. xxv.

M. Sig.—Take a teaspoonful as often as required.

We make use in France of an alcoholic tincture of the leaves, and of the bark, which is given in the dose of from 5 to 25 drops several times a day. Finally, Petit has made a dry extract of hamamelis, which you may give in pills of two grains each. For external use, you may make use of ointments or lotions with the different solid or fluid preparations.

As for the doses, they may be pretty large; never in fact, in experiments on animals, whatever may have been the dose administered, have we obtained any toxic effect—I may even say any physiological effect. It was important, in fact, to know whether this hamamelis, which was credited with such active properties on the circulation and on that of the veins in particular, manifests this action on animals. In regard to this, we have observed nothing; I ought, however, from the point of view of toxic action, to mention certain cerebral symptoms of some gravity which Dr. Campardon says that he observed during the usage of hamamelis. There would seem to be some mistake here, for never have any such symptoms been observed in America where such free use is made of Pond's extract.

I have employed hamamelis, as the Americans have advised, in the treatment of hemorrhoids, and even of varices. In the case of hemorrhoids I have obtained, in a few instances, a very marked action, which has consisted principally in the diminution in size of these piles, and in the disappearance of the sensation of weight and pain which accompanied them. The dose which I have administered is a teaspoonful of the fluid extract five times a day, or 10 drops of the tincture. These doses have given me no results in the treatment of varices, and whatever Dr. Musser may have said, I believe that hamamelis is absolutely inefficacious in such cases.

Finally, I ought to remind you that Serrand has locally employed the preparations of hamamelis in congestive affections of the larynx and pharynx. To sum up: hamamelis is, as you see, a medicament of little activity, but which you can utilize in cases of hemorrhoids, especially when complicated with pain.

In conclusion, it remains for me to finish what pertains to new gastro-intestinal medications by speaking to you of antiseptic intestinal medication, but this is a subject which has undergone great de-developments, and to which I intend to devote the next lecture.

CHAPTER V.

ANTISEPTIC INTESTINAL MEDICATION.

Pathologists have long suspected that in a certain number of infectious diseases, the fermenting contents of the intestines, and putrescent fæcal matters, may have a preponderant rôle, and this view has been especially entertained respecting the pathogeny of typhoid fever. In fact, in this disease the contagious principle has long been located in the dejections. But the discovery on the one hand of the alkaloids of putrefaction, and the attentive study of micro-organisms on the other hand, have given us a clearer insight into this pathological question and established on scientific bases an antiseptic intestinal medication. Before describing the agents of this medication, I have something of importance to say concerning the examination of intestinal matters from the point of view of putridity, and concerning physiological experiments which have been made to elucidate this subject.

The existence of putrid fermentation taking place in the contents of the intestines is proved by: (1) the presence of certain micro-organisms; (2) certain cadaveric alkaloids; (3) finally, certain special products, such as indol and skatol, which originate in modifications undergone by albuminoid matters.

(1) As Netter has well remarked in his able review of the chemical poisons which the organism produces, it is to Leuwenhoeck that we must ascribe the discovery of the micro-organisms contained in fæcal matters. This early microscopist noted the presence in fæces of animalcules, similar to the anguillulæ of vinegar, but of infinitely smaller dimensions. Since then all these organisms have been classified, and micro-biologists have described multitudes of all varieties and species. These micro-organisms have several origins; they are derived from our food, which contains a prodigious quantity; they exist also in the air which we breathe, which contains innumerable microbes, as the curious researches of Miquel have shown

This air, it may be said, does not penetrate into the intestine; this is true, but it filters through the anfractuosities of the nasal fossæ and the pharynx, and these micro-organisms, retained in these points by the secretions of the mucous membranes, easily gain the digestive tube.

It is in this way, I believe, that is explained the diarrhœa so frequently provoked by prolonged sojourn in our post-mortem and dissection rooms.

Miquel has, in fact, shown us that the number of microbes varies considerably according to different places, and that between the air which one breathes from the top of the Pantheon, and that of our hospital wards, there is a great difference as regards the quantity of contained micro-organisms.

To those microbes introduced by alimentation, and those which enter through the nasal and oro-pharyngeal passages in the inspired air, we must add those which develop in the digestive tube itself, and form a fixed population. I must again refer to the experiments performed by Miquel who, searching with all the rigor of Pasteur's culture processes to find what were the points of the economy which might permit the development of bacteria in nutrient culture liquids, showed, what one might have anticipated, that the lungs and the digestive tube are the only organs capable of determining a culture of microbes.

As for the digestive tube, the activity of the ferments is much greater the farther you get from the stomach and the nearer you approach the inferior extremity of the alimentary canal. Hence, then, from all that goes before, it remains settled that in the physiological and pathological state, fecal matters and the contents of the intestine contain a great quantity of proto-organisms.

Passing now to the alkaloids of putrefaction, since the researches of Selmi, which go back to 1872, we know that the name *Ptomaines* has been given to certain alkaloids derived from bodies undergoing putrefaction.

These ptomaines are found in considerable abundance in fecal matters, and their origin, as well as the part which they perform in the economy, merit attention.

The idea which Selmi had conceived of attributing to putrefaction the production of the ptomaines which he observed, is not absolutely exact, and it seems demonstrated that certain animal alkaloids can be generated apart from putrefaction; the experiments of Prof. Armand Gautier are, in this respect, very convincing.

Before Selmi, Gautier had already shown that these alkaloids might come from modifications which are undergone by albuminoid matters apart from putrefaction; so, generalizing from this fact, he considers the alkaloids of animal origin as one of the physiological products of the living cell; and just as the vegetable cell makes alkaloids, such as quinine, strychnine, etc., the organic cell also produces similar principles, to which Gautier gave the name of *leucomaines*.

Moreover, Tanret, in 1882, called our attention to this important point, which quite confirms Gautier's views, viz.: that the peptones give most of the reactions of the alkaloids.

Brieger has completed these researches in directly obtaining an alkaloid from the action of gastric juice on fibrin. In fine, it has been ably maintained that the micro-organisms may produce alkaloids varying according to the species of microbes observed.

To sum up, it is seen then that fæcal matters contain organic alkaloids having a quadruple origin; they may result from the putrefaction of absorbed albuminoid substances; they may take their source in alkaloids furnished by the living organism, according to the theory of Gautier; they may be due to the action of gastric juice on fibrin, according to Tanret's experiments; in fine, they may be the result of the presence of micro-organisms, which, as we have said before, exist in so great quantity in the digestive tube. We know by accurate physiological experiments the action of these ptomaines or leucomaines; we know that they determine in the living organism symptoms quite analogous to those that are produced by muscarine. They are veritable poisons of the heart, and you see developed in animals to which they are administered convulsive troubles and pupillary modifications.

In fine, there exist in intestinal matters products derived from fermentation: leucine, tyrosine, stercorine, excretine, indol, skatol, phenol, etc. If it be true, as Kühne has pointed out, that the two first of these bodies, tyrosine and leucine, may be produced apart from putrefaction by the action of one of the ferments of the pancreatic juice. trypsin; if stercorine and its derivatives take their origin in modifications undergone by the bile, indol, phenol, and skatol result, on the contrary, from putrefaction of nitrogenized substances introduced in the intestines.

So, then, it seems to be established on unquestionable scientific bases, that, in the physiological state, the intestinal contents include micro-organisms, organic alkaloids, and all the derivatives which result from the putrefaction of albuminoid substances.

More than this may be affirmed; and Prof. Bouchard, who was one of the first to attribute to all these phenomena their true semeiological value, has shown that these putrescible substances may in certain circumstances not merely fail to be eliminated in the fæcal matters, but even penetrate the economy by the vast field of absorption which the intestinal mucous membranes afford them, and thereupon determine a symptomatic aggregate tolerably well defined, and very similar to what one observes in the different forms of anæmia, and to which he has given the name of stercoræmia.

From all the above we can draw this important conclusion: That man in the physiological state necessarily produces poisons, more or less virulent, and that the condition of health for him consists in their regular and rapid elimination by the different emunctories of the economy, and particularly by the kidneys and intestines; nor must I omit to mention the liver, which has for its function the destroying of a certain number of these toxic alkaloids. But let some circumstance come to interrupt this equilibrium—let the liver cease its functions; let the glomeruli of the kidneys become obliterated; let too active an absorption take place from the intestines, whether by abnormal shedding of its epithelium, or by the presence of ulcerations, or by want of power on the part of the digestive ferments sufficiently to stay the production of phenomena of putridity—in all these cases there may ensue a pathological state for the relief of which we may be called upon to render assistance.

Humbert had already, in 1873, pointed out in his thesis the importance of these septicæmias, but it is to Bouchard that the credit belongs of having brought all these facts together into a pathological unity.

The physician can, and ought to, interfere to combat these intestinal septicæmias, and he attains this end in employing two kinds of medicaments—one kind which has for its object to prevent putrid fermentations from developing in the digestive tube, and to destroy the toxic elements which are found there; another which has for its end the favoring of the rapid elimination of these matters from the intestines. Let us examine each of these indications, and the indications designed to fulfill them, commencing with the last:

The indication to eliminate the toxic matters found in the digestive tube, and to favor their speedy issue, is fulfilled by purgation. I need not here occupy much time with the general subject of purgatives. I cannot, however, forbear remarking how strikingly the interesting researches on the putrid fermentations of the intestines harmonize with and justify the traditional medication of our fathers.

Substitute in fact for the words *peccant humors, atro-biliary humors*, the words *micro-organisms, alkalloids of putrefaction*, and you will understand the importance which the physician of the olden times attached to this group of medicaments, and you will better appreciate the language of the physicians of Molière's time, whose very phraseology the immortal comedian has transmitted to us in his *Malade Imaginaire*. It was not then to expedite from the system the bad humors of Monsieur Orgon that Fleurant employed the numerous apozemes prescribed by Purgon, but really (in modern language) to expel the putrid elements which had developed there.

The group of purgatives already so numerous, has been enriched in the last few years by a vegetable substance with which we have experimented in our service, and which seems to possess a real efficacy. I allude to Cascara sagrada, very much vaunted in America.

The Cascara sagrada, or to speak more scientifically, the Rhamnus Purshiana, is a shrub which grows in abundance on the borders of the Pacific in North America, and belongs to the family of Rhamnaceæ, which has already furnished medicine with an energetic purgative, the buckthorn (rhamnus catharticus).

It was Bundy who in 1878 first pointed out the purgative properties of the rhamnus Purshiana, and Landowski was the first to introduce it into France.

The part employed is the bark, which contains different resins, which give to it its purgative action. This medicament is administered under two forms. The Americans employ chiefly a fluid extract in the dose of thirty to forty drops. In France we use especially the powdered bark put up in the form of capsules, each containing about four grains. This dose generally suffices to produce one regular stool every day; when it is insufficient you can administer one capsule in the morning and another in the evening. The purgative effects thus obtained are quite satisfactory, and without partaking of the enthusiasm of certain American journals, I believe, nevertheless, that this new medicine deserves to retain a place in therapeutics between podophyllin and rhubarb as a remedy in habitual constipation.

Passing now to the true intestinal medication, *i. e.*, to the medicinal agents which are capable of modifying the putridity of intestinal matters, we find that these substances may be introduced by two channels; either directly into the intestines by means of enemata, or indirectly by the mouth. The antiseptic or aseptic substances which can be introduced directly into the intestine by way of enemata are not very numerous, and this is on account of the irritant and toxic action of most of them. The dangers which attend the free use of carbolic acid are well known, and to avoid such risks we are obliged to employ substances which are but slightly irritating and toxic, such as salicylic acid (unfortunately little soluble), boric acid, and cupric sulphate. But the lavements which succeed the best in such cases are those which Bouchard has long recommended, and which consist simply of water in which a certain quantity of pulverized charcoal is suspended. For these lavements charcoal from poplar wood, prepared according to the directions of Belloc, is superior to any other; it forms in fact with water an almost homogeneous mixture. You suspend, then, in six ounces of water, two or three tablespoonfuls of Belloc's charcoal powder, and administer the whole as an enema to the patient.

These injections have no toxic effect and they disinfect perfectly the contents of the large intestine. Their action is, however, local and extremely limited, so that when you desire to practise antiseptic intestinal medication thoroughly, you should endeavor to disinfect the entire intestinal tract, and for that purpose medicinal substances should be introduced by the mouth.

Among the medicaments worthy of being advised for this object, there are three to which I desire to call attention: namely, charcoal powder, iodoform, and carbon-bisulphide water. We have here again powdered charcoal, which is a good medicament, but which is attended with several disadvantages, such as the necessity of taking large quantities to obtain a sufficient disinfectant action, and the fact that this substance, which certainly will deprive the stools of their bad odor, does not destroy the organized germs which are there.

Iodoform in this respect is much more active; it is not only a disinfectant, but it is also powerfully aseptic. Unfortunately, it presents the disadvantage of being an active and irritant medicament. Whenever I have had recourse to it, whether in the form of granules of iodoform, or of capsules containing iodoform dissolved in ether, I have produced a speedy irritation of the stomach if I have desired to prolong the action of the medicament.

Therefore, I much prefer the carbon-bisulphide water, which I have employed with so much success in our hospital wards.

I give the name of carbon-bisulphide water to the solution by agitation of this chemical in water. We thus obtain a liquid possessing a strong odor of carbon bisulphide, and containing a quantity of the latter concerning which authorities are not agreed; while Peligot fixes it at one drachm per quart, Ckiandi-Bey thinks the proportion only one-fourth as much.

This solution has a rather agreeable taste, and leaves a cool, fresh sensation in the mouth; mixed with milk or with wine and water, the taste almost entirely disappears. Allowed to stand in any receptacle, this water loses little by little by volatilization its bisulphide of carbon, its taste, its smell and its properties: therefore it is always necessary, in order to keep the solution of the same strength, to have a little undissolved bisulphide of carbon in the flask.

This is our formula for this solution:

℞ Carbon bisulphide, 25 grams.
Water, 500 grams.
Spts. peppermint, gtt xxx.

M.

Put into a flask of the capacity of seven hundred grams, shake and let the mixture settle. Eight, ten, or more tablespoonfuls of this water should be given per day, care being taken to pour each spoonful into a half tumblerful of wine and water, or of milk; the patient should be recommended also to replace with fresh water the water in the flask as fast as it disappears by use. I add, to finish what pertains to this pharmaceutical preparation, that bisulphide of carbon is of moderate price, so that this solution is quite cheap, costing only a few farthings per litre, and I come now to the physiological and therapeutical properties of carbon bisulphide water.

It is a matter of history that, since the writings of Delpech, who attributed violent toxic properties to this medicament, carbon bisulphide was considered a dangerous medicament. We feared its action on the nervous system, *i. e.*, the paralysis (partial or general), the impotence, etc., which were ascribed to its use. External applications were, indeed, made in the case of wounds of a bad condition, and Guillaumet wrote an able paper on this use of the remedy. So when I commenced my researches on the bisulphide of carbon, it needed the reiterated assurances of M. Ckiandi-Bey, who told me of the great chemical works in France and elsewhere where they manufactured bisulphide of carbon, and the two thousand operatives constantly employed in these works, none of whom ever experienced the least symptoms of poisoning from freely handling this substance and breathing its gaseous emanations—it took all this to decide me to make trial of it in my hospital practice. The experiments which I have made on animals with my excellent interne Sapelier, who has devoted his inaugural thesis to this topic, promptly convinced me of the innocuousness of bisulphide of carbon, and since then I have constantly used the carbon-bisulphide solution in the treatment of infectious diseases. By means of this water the stools are disinfected perfectly, and the noxious germs which they contain are destroyed, and under the influence of this treatment the infectious diarrhœas disappear. I have also found this medication of benefit in putrid dyspepsia with dilatation of the stomach. For more than six months I have been giving this carbon-bisulphide water in typhoid fevers, in doses of from 5 to 10 tablespoonfuls a day, according to the intensity of the diarrhœa, and I have obtained most satisfactory results from the point of view of intestinal antisepsis. Nor have I seen any untoward accident from its employment. It is understood that the sulphide of carbon has no action except in relation to the putrid phenomena taking place in the intestine, and that it can in no other way modify the course of typhoid fever, which is a general disease, of which the intestinal troubles are only one phase. But in addressing itself to this one marked feature of the disease, and in favorably modifying putrescent intestinal processes, carbon bisulphide has been proved to be possessed of efficacy above all other medicaments.

I shall complete the subject by another lecture on Antiseptic Medication in General.

CHAPTER VI.

NEW PULMONARY MEDICATIONS.

I desire in the present lecture to bestow some consideration to the subject of antiseptic medication in general. Already, in the foregoing chapter, we have been occupied with antiseptic intestinal medication, and I wish to show you that this question of antiseptic medication is of much wider application, that it has a great future in store for it, and that modern therapeutics is even dominated by it.

It is to our illustrious countryman, Pasteur, that we owe this real medical revolution, for in showing us the living nature of contagion, he has also pointed out to us the new course that therapeutics must henceforth pursue. The proposition formulated by Bouley: "Every virulent disease is the function of a microbe," tends more and more to find its verification, and to overpass the bounds first assigned to it, for we to-day see pneumonia lay claim to microbiotic origin. Pasteur's merit does not so much consist in his discovery of the living nature of contagion, as in the processes which he has put in usage for the cultivation of the virulent principle, and in the means which he has employed for the attenuation of their noxious properties, so as thus to constitute attenuated viruses which preserve man from fresh attacks of the disease.

I do not intend here to sketch the history of these attenuated viruses—veritable new vaccines—but I desire to give you some instruction concerning the medicaments at our disposal to destroy the micro-organisms by which we are surrounded.

The atmosphere, as you know, contains microbes in great numbers, and one may even affirm that the salubrity of the air is in direct relation with the quantity of these micro-organisms. Are they very numerous? the air is unwholesome; are they, on the other hand, very few? the air is regarded as wholesome. Do not think that these are theoretical notions, for experience is every day confirming their reality; thanks, moreover, to the ingenious processes devised by Marié Davy, and Miquel, we are able to determine with almost mathematical accuracy the number of micro-organisms flitting in the air. Consult in this regard the interesting Annuals of the Observatory of Montsouris, for the year 1882 and 1883, and you will find statistics of the greatest interest.

While at the summit of Mount Blanc the air is, as a rule, free from microbes; in our cities, on the contrary, they abound, and their number varies according to localities. Thus, in the park at Montsouris only 51 microbes to the cubic metre are found; in the streets of Rivoli, on the other hand, the number is increased to 680, and they are still more numerous in the confined air of our apartments and our hospital wards. In a bed chamber in the street

Monge they have been known to attain the figure of 5,260 per cubic metre; but it is in our hospital wards that the proportion is the greatest, and there we see them exceed the figure of 28,000 per cubic metre; in the Lisfrane ward, for example, at the hospital Pitié. These figures speak sufficiently of themselves and I need not further dwell on this point.

Apart from these thousands of proto-organisms which thus flit about in the air, and which we at each breath draw into our lungs, there exist still other microbes more fixed and more resisting, and which can only penetrate the economy by the way of inoculation.

To judge of the value of a medicament which is supposed to have the property of destroying these divers organisms, two processes have been principally employed: the one based on experimentation on living animals, the other on fermentations.

The experimental method, that is to say, that which consists in neutralizing the different viruses by a medicament, then in inoculating them in animals, has been followed by veterinary medicine, and it is to our French veterinary school that we owe the most brilliant researches in this direction. It was Renaut who made the first tentatives of this kind, tentatives which have been pursued by Colin, by Bouley, by Chauveau, by Touissant, etc. But if this experimental method has furnished us precious information, it was impotent to establish a classification of medicaments suitable to destroy the microbes. In fact, according to the virus employed, according to the operative procedure put in usage, according to the animals under experimentation, the results may vary, and you understand how difficult it is to found on such bases a classification of anti-microbic medicaments.

Hence it is that this process of inoculations has been reserved for the study of certain virulent principles such as that of anthrax or tuberculosis. It is in this way that Arloing, Cornevin and Thomas have studied the action of antiseptics on the anthracoid bacteridium and Hippolyte Martin, Coze and Simon have employed the same process to decide the value of antiseptic medicaments in the destruction of the bacillus tuberculosis.

This experimental method is moreover one of the most simple, and consists in mixing well-defined micro-organisms, such as bacteria of anthrax and the bacilli of tuberculosis, with divers medicinal substances, and in seeing what one of these agents shall render these microbes harmless when introduced under the skin. We may, moreover, vary this experimentation; we may precede or follow the inoculation of bacilli by medicinal injections; or we may endeavor to render the animals refractory to this inoculation by an appropriate medication. In this chapter, which is devoted to general considerations, I cannot set forth the results of these experiments; I shall return to them, however, in another lecture, when I shall speak of the new methods of treating pulmonary diseases.

The fermentation method, on the other hand, presents great advantages in enabling us to multiply experiments, and in rendering these sufficiently short and rapid so that a regular gradation of antiseptic medicaments may be established.

Three processes may be put in usage in this fermentation test; the first, which is the oldest, consists in mixing with certain putrescible substances medicinal liquids, and in noting those which retard or prevent putrefaction, and as far back as 1750 Pringle built on these bases a classification of anti-putrescent medicaments.

Petit in 1872 proposed another experimental process based on the quantity of carbonic acid set free by fermentable mixtures. He placed in these mixtures given quantities of certain substances and judged their anti-fermentative power by the quantity of carbonic acid set free in a given time.

But Pasteur, in showing us that putrefaction is the resultant of the development of special organisms in fermentable liquids, has furnished us the best means of estimating the value of medicaments called antiseptic or antifermentative, since the microscopical examination enables us to judge of the presence or absence of the proto-organisms of fermentation in the liquids.

O'Neal, in 1878 was one of the first to follow out this line of experimental research, and we have seen Bucholtz, Kuhn, Habercom, Jalan de la Croix, Gosselin and Bergeron, Miquel, Sternberg, and more recently Ratimoff perfect this method, and base upon it a classification of antiseptic medicaments.

In carrying out this line of investigation, the experimental mode has varied with the authorities. Some, as Gosselin and Bergeron,* from an exclusively chemical standpoint, reproduced in their experiments the conditions of antiseptic surgery realized by Lister. They placed in a couple of test tubes one gram of fresh blood or serum, covering the one with simple tarlatan, the other with medicated tarlatan, and subjected them to various antiseptic sprays, taking note what effect these pulverizations had on the appearance and development of the bacteria of putrefaction.

Other experimenters have followed Pasteur's procedures in the culture of the schizophytes, and have sought to find the quantity of liquid that would antagonize the growth and multiplication of these organisms. Thus it is that Bucholtz studied in a culture liquid which bears his name, and whose formula we give below,† the influence of certain anti-

*A study of the effects and mode of action of substances employed in the antiseptic dressing. (Compt. rend. de l. Acad. des Sciences, Nov. 22, 1879).

†Bucholtz' culture liquid:

Sugar candy, 10 grams.
Tartrate of ammonia, 1 gram.
Phosphate of lime, 0.50 gram.
Distilled water, 100 cub. centimetres.

M.

septic substances on the bacteria developed by the fermentation of tobacco.* In this way also Koch has studied the antiseptic power of medicinal substances on the culture of anthracoid bacteria;† and Sternberg has tested the action of antiseptics on the micrococci of blenorrhagia, and the microbe developed by the injection of human saliva in the hare.‡

Miquel has established his classification on a somewhat diffierent basis, that is to say on the quantity of the medicament necessary to prevent putrefaction from taking place in a litre of neutralized broth, the degree of asepsis of the medicament being thus determined by the quantity requisite to obtain this sterilization.

Thus he has divided antiseptic substances into several groups; those which are *eminently* antiseptic and which are efficacious in the proportion of from 1 to 70 centigrams per litre; those that are *very strongly* antiseptic, from 10 centigrams to 1 gram being required; those which are *strongly* antiseptic in the

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*Bucholtz, Antiseptica and Bakterien; Untersuchungen über der Temperatur auf Bakterien-Vegetation (Arch. für experiment. Pathol., 1875, t. IV, p. 1-80 et p. 159-168). Uber das Verhalten Bacterien zu einingen antiseptica (Dissertation inaugurale, Dorpat, 1876).

†Koch über Desinfection (Mittheilungen aus dem Kaiserlichen gesund heitsamte, B. I, 1881, p. 234, 282).

‡Sternberg, the American Journal of the Medical Sciences, April, 1883, p. 289-299

proportion of 1 to 5 grams; those which are *moderately* antiseptic in the proportion of from 5 to 20 grams; those that are *feebly* antiseptic, from 20 to 100 grams being necessary; lastly, those that are *very feebly* so, requiring from 100 to 300 grams. Let us examine successively each of these groups.

In the substances eminently aseptic are found the salts of mercury and silver; these constitute this group. It is understood that the figures which correspond to each one of these medicaments represent the minimum capable of preventing the putrefaction of a litre of broth:

Biniodide of mercury	25	milligrams.
Iodide of silver	30	"
Oxygenated water	50	"
Nitrate of silver	80	"
Bichloride of mercury	70	"

The second group comprises certain very important medicaments; they are as follows:

Osmic acid	15	centigrams.
Chromic acid	20	"
Chlorine	25	"
Iodine	25	"
Chloride of gold	25	"
Bichloride of platinum	30	"
Hydrocyanic acid	40	"
Iodide of cadmium	50	"
Bromine	60	"
Iodoform	70	"
Chloride of copper	70	"

Chloroform	80	centigrams.
Cupric sulphate	90	"

The third group is the longest; I will particularize the following substances:

Salicylic acid	1.	gram.
Benzoic acid	1.10	"
Cyanide of potassium	1.20	"
Bichromate of potassium	1.20	"
Picric acid	1.30	"
Ammonia	1.40	"
Zinc chloride	1.90	"
Essence of mirobalane	2.60	"
Sulphuric acid, Nitric acid, Hydrochloric acid, Phosphoric acid.	2 to 3.	"
Essence of bitter almond	3.	"
Phenic acid	3.20	"
Permanganate of potash	3.50	"
Alum	4.50	"
Tannin	4.80	"
Oxalic acid, Tartaric acid, Citric acid,	3 to 5.	"
Sulphate of potassium	5.	"

The fourth group (substances moderately antiseptic) contains the following medicaments:

Bromhydrate of quinine	3.50	grams.
Arsenious Acid	6.	"
Sulphate of strychnine	7.	"
Boric acid	7.50	"
Hydrate of chloral	9.30	"

Salicylate of sodium	10.00 grams.
Sulphate of protoxide of iron	11.00 "

In the fifth group, feebly antiseptic, we note:

Sulphuric ether	22 grams.
Hydrochlorate of morphine	75 "
Ethyl alcohol	95 "

In the sixth and last group we find:

Iodide of potassium	140 grams.
Chloride of sodium	165 "
Glycerin	225 "
Bromide of potassium	240 "
Hyposulphite of sodium	275 "

When you give a geeneral glance over the above tables, you cannot fail to note the high rank in the scale of asepsis which is occupied by the noble metals, such as mercury, platinum, silver, and gold. In a rank a little below we must place the common metals, such as copper, iron, etc. To the third rank belong the alkaline earthy metals, and a fourth place must be assigned to the alkaline metals.

Hence the attempt has been made to establish a certain correspondence between the atomic weight of the metals and metalloids and their antiseptic power; the higher the atomic weight, the greater the antiseptic power. This rule, true if you compare together mercury, platinum, and iodide of potassium, no longer finds verification if you consider such bodies as chlorine, bromine, and iodine; thus, bromine, which has an atomic weight three times larger than chlorine, has an aseptic power three times less.

The rule holds good when you examine organic bodies of a same series. Take, for example, the alcohols of fermentation;* I have experimentally shown that their toxicity follows the ratio of their atomic formula. The higher the latter, the greater their toxic power; it is the same with reference to asepsis, and the table which I here place before you makes this difference plain:

Ethyl	alcohol	C^2H^6O.	Degree	of asepsis,	95.
Propyl	"	C^3H^8O.	"	"	60.
Butyl	"	$C^4H^{10}O$.	"	"	35.
Amyl	"	$C^5H^{12}O$.	"	"	14.

To sum up, then: You see that, save in exceptional cases, we are warranted in saying that, in the same series the higher the atomic weight the greater the antiseptic power.

But if the experiments of Miquel enable us to establish a table of aseptic substances, we are far from having solved all the questions which pertain to asepsis, and the experiments of Koch, those especially of Jalan de La Croix,† made under the direction of

*Dujardin-Beaumetz and Audigé, Experimental Researches on the Toxic Power of the Alcohols, Paris, 1879.

†Jalan de La Croix, Das Verhalten der Bacterien das Fleischstassers gegen einige Antiseptica (Arch. für exp. Pathol., 175-225). Ratimoff, sur les antiseptiques (Arch. de phys., 1884).

Draggendorff at Dorpat, and finally those made still more recently in Pasteur's laboratory by Ratimoff show us how complex is the problem with which we have to deal.

These experiments have shown that according to the micro-organisms cultivated, according to the culture medium of a same micro-organism, according, lastly, to the state of the latter, whether germ or developed microbe, the degree of asepsis produced by the same substance varies materially. Thus, to give an example, when you compare the action of antiseptics on the septic bacteria and on the anthracoid bacteridia, you see that the former are much more resistant than the latter. As for the germs, they generally resist much more effectually than the filamentous bacteria. Thus, in the case of corrosive sublimate, you need a dose a hundred times stronger to kill the germs of the bacteria of anthrax than to destroy these same bacteria in the state of filaments.

The antiseptic power varies with the culture medium. To prevent the production of germs in meat broth, you require a dose of one thirteen thousand three hundred and tenth ($\frac{1}{13310}$) of corrosive sublimate, while in the case of animal muscle twenty-six times as much is necessary. When sulphate of copper is chosen, the difference in the amount requisite for such asepsis is greater by only four times in the case of muscle, and this difference is almost nil with respect to boric acid, and while it takes of the latter antiseptic only $\frac{1}{100}$ to prevent the development of germs in flesh, it requires but $\frac{1}{135}$ to stay their development in broth.

But these differences are still more striking when we pass from the domain of the laboratory to that of clinical medicine, and while recognizing how useful it is to have precise notions respecting antiseptic medicaments, it is necessary always to bear in mind how difficult of application to the destruction of micro-organisms developed in the economy are these notions.

When I come to speak of new pulmonary medications you will see that if the knowledge of the tubercle bacillus has enabled us better to understand the pathological anatomy and etiology of tuberculosis, it has rendered us very meagre service from a therapeutic point of view, and all the endeavors made to destroy these bacilli when they have undergone development in the organism have thus far failed. Therefore, our colleague, Ernest Besnier, has with some reason maintained that antiparasitic or antimicrobic medications utterly fail to destroy morbid germs except so far as they destroy at the same time the living elements which contain these germs. I believe, nevertheless, that if the solution of the question presents serious difficulties, it is not insoluble. Already Pasteur by his eminently useful labors has shown us a quite particular mode of solution in creatng by the inoculation of attenuated viruses a medium refractory to certain micro-organisms; possibly we shall some day find medicinal agents which, introduced into the organism, may render the latter rebellious to the culture of the micrococci, and it is in this direction that the therapeutics of virulent and infectious diseases must tend.

Apart from the interest which is connected with this classification of antiseptic medicaments, these experiments have from a therapeutic point of view given valuable indications concerning the nature of certain affections. In taking our stand on the old adage: "*naturam morborum curationes ostendunt*," when we come to consider the high degree of asepsis of the mercurial salts and even of iodide of potassium, we might feel ourselves warranted in affirming the microbiotic origin of syphilis, and without doubt the antisyphilitic property, heretofore inexplicable, of these preparations, resides in their anti-bacillary power.

The antiseptic medication has also been applied in the form of vapors of gases or of sprays in order to destroy the numerous germs that flit about in the air. I shall not here enter into the subject of Listerian atmospheres, with which you are acquainted, but I ought to say a few words concerning the experiments which have been made in this hospital under the eminent superintendence of M. Pasteur, and his zealous co-laborator M. Roux; experiments in which the greater part of you have assisted, and which had for their end to form a correct estimate of the different

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processes put in use to disinfect habitations occupied by patients affected with contagious diseases. This is one of the aspects of antiseptic medication which belongs more especially to hygiene, but which nevertheless presents a great interest.

We have only made use (as you well know), of gaseous substances, such as chlorine, bromine, nitrosile, and sulphurous acid. You are well aware that this latter gas has seemed to us far preferable to any other by reason of its force of penetration, and in a communication made to the Academy of Medicine in the month of September, I gave a detailed account of these experiments.* I shall not, then, describe them now, only reminding you that of all these gases the sulphurous is the most penetrating, and that you can obtain this gas by three methods; by burning sulphur, by employing the anhydrous sulphurous acid of Pictet, or by burning carbon bisulphide in the ingenious lamp of Kiandi Bey.

Twenty grams (5 drachms) of sulphur per cubic metre destroy the different micro-organisms in the liquid state, but you must increase the quantity if you desire to destroy these same organisms when existing in a dry state. In fact, since my last communication to the Academy of Medicine, Dr. Bardet and

*Dujardin Beaumetz, Experiments on the Disinfection of Places Occupied by Patients Sick with Contagious Affections. —Bull. de Therap. t. cvii, p. 241.

myself, aided by M. Chambon, have continued these experiments on the micro-organisms in the dry state, and in particular on the vaccine virus.

We took pustules of desiccated vaccine, which we reduced to a fine powder and placed in rooms where we were burning variable quantities of flowers of sulphur.

When the quantity did not exceed 20 grams per cubic metre, this vaccine powder did not lose its properties, and we were able by inoculating it in animals or in children to obtain a vaccinal eruption. With 30 grams per cubic metre, the results obtained are uncertain, sometimes the inoculation succeeds, sometimes it fails, owing to the vaccine powder having lost its properties; but when the dose is attained of 40 grams per cubic metre, the inoculations are always negative. So then, in the case of vaccine, and probably of variola, if we would be sure of destroying the contagious germs in a dry state, it is necessary to double the quantity of 20 grams which we had first established.

If we may rely on the experiments of Vallin and Legouest, 20 grams suffice for typhoid fever; 40 grams are necessary for the microbe of tuberculosis, according to Vallin; here, also, as in the case of the culture bouillon, the doses vary according to the micro-organisms under experimentation. Moreover, the results at which we have arrived are absolutely confirmatory of those which Polli obtained at Milan, Pettenkoffer at Munich, Mehlhausen at Berlin, Dougall at

Glasgow, Fatio at Geneva, Pietra Santa at Paris, and lastly of the researches of Vallin, published in his able work on Disinfectants.

Such are the general considerations which I desired to present relative to the antiseptic medication as it ought to be understood in our day. I propose, moreover, to complete what I have to say on this subject, in a future lecture on "Antiseptic Pulmonary Medication," and we shall see what we have to hope from an anti-microbic treatment in its application to a bacillary disease like tuberculosis.

CHAPTER VII.

NEW PULMONARY MEDICATIONS.

Gentlemen: I propose to speak to you to-day of the new pulmonary medications, and I shall devote to this subject two lectures, one of which shall be reserved exclusively for the modifications introduced into the treatment of pulmonary phthisis by the discovery of the tubercle bacillus. In the present lecture I shall consider the following topics: the application of mechanical apparatuses to the treatment of diseases of the thorax, and certain new medicaments addressed, the one to asthma, viz: the euphorbia pilulifera, the others to the catarrhal affections of the lungs; these are terpine and terpinol.

In the second volume of my Clinical Therapeutics I have had a great deal to say about the benefits derivable from mechanical means in the treatment of pulmonary affections, and to-day there is not a large city in Europe which does not possess appliances for baths of compressed air or cabinets constructed on the type of Waldenburg's, which give both compressed and rarefied air. I shall not dwell on this point now, but shall only call your attention to the great improvements effected in this pneumatic apparatus by my pupil, Dr. Maurice Dupont.

You are all familiar with Waldenburg's cabinet; this veritable gasometer has the disadvantage of being of high price, of large and ungainly size, and (in particular) of not being able to furnish at the same time compressed and rarefied air. Schnitzler, of Vienna, has done away with this latter disadvantage by providing a double gasometer, but the management of the automatic stop-cock which enables one at each stage of the respiratory movement to obtain compressed or rarefied air is very complex and difficult, and it requires long familiarity with this instrument, which resembles at first sight a cornopean, to be able satisfactorily to use it.

Dupont's instrument, which I have adopted in my hospital service, and which I here show you (see Fig. 4) is much more simple. Here we use the force of falling water which by a special mechanism employed in the arts (*"procédé de la trompe"*), supplies the rarefied air which the patient breathes. As for the compressed air, this is also engendered by the water which flows from the tube into the receiver. The apparatus has but little size, costs but little, and its mechanism is very simple. In order to make it operate, it is sufficient to move the manipulator A from right to left if you would have compressed or rarefied air. By successive improvements, Dupont has succeeded in heating the air when that is desirable, and in charging it with aromatic principles.

Its only disadvantage is that, in order to make the apparatus work, a considerable water pressure is requisite, but this is only a relative inconvenience, since at the present day all our principal cities possess sys-

FIG. 4

[redacted]

tems of water delivery, and the apparatus can be connected with any water faucet.

You are familiar with its modus operandi. The patient seats himself before the apparatus, and closes with the stopper the mouth-piece of the breathing tube. Then he moves the manipulator to the right or to the left; on the left it is in relation with rarefied air, on the right with compressed air; he then takes care to inspire in the compressed air and expire in the rarefied air.

Owing to the compression of the air of inspiration this air penetrates with considerable force into the entire respiratory tract, from which it issues with facility during expiration in the rarefied air; there results therefrom a true aerial lavage of the whole bronchial and pulmonary passages, the residual air which stagnates in the pulmonary vesicles being expelled.

In all the diseases in which this respiratory residuum is considerable, as in pulmonary emphysema the result of bronchial catarrh, the advantages of such a medication are apparent, and if you associate with it balsamic vapors, you can thus treat with it at once both the pulmonary emphysema and the catarrh of the bronchi. This aerial lavation of the lung is the only treatment applicable to pulmonary emphysema, and with the bath of compressed air it constitutes an effectual agency with which to combat this disease.

Recently Tisy has proposed to substitute for the apparatuses of Waldenburg and Dupont a double-acting bellows, which the patient can easily manage, for it is of small size. This apparatus is but little complicated, but it will not be likely to come into general use, for its management is fatiguing to the patient, and it takes long practice in order to manipulate it to advantage. Quite different is the means proposed by Dr. Bazile Feris, Professor of Therapeutics at the School of Naval Medicine of Brest.

Struck by the fact that the respiratory distress in the emphysematous is due chiefly to the difficulty of expiration, Bazile Feris augments the expiratory forces of the thorax by the aid of an elastic respirator. Nothing is simpler than this instrument, which you can see applied to one of my patients. It is a veritable

FIG. 5.

double hernial truss (see Figs. 5 and 6), which is applied over the thorax instead of over the abdomen.

It is to the dorsal region that you apply the fixed portion of the apparatus, while the two elastic portions (the spring pads), after having passed under the arms, are adjusted in front of the chest over the region of

Fig. 6.

the mammæ. When the patient makes an effort of expiration, this truss, by the elastic pressure which it exerts upon the thorax, aids and favors this movement.

Thanks to this elastic respirator, which is quite an ingenious contrivance, we see the emphysematous recover in part their respiratory functions, and you have been enabled to notice this result in my service in two of my patients, who could not engage in a brisk walk without being out of breath, while now, by virtue of this apparatus, they can walk and run without difficulty. Moreover, Dr. Feris has measured the respiratory capacity of the emphysematous before and during the application of his elastic respirator, and this respiratory capacity was always greater when the patients wore the thoracic truss. You will then be able to have recourse to this means, and the more so from the fact that the apparatus is not costly, and is easily concealed under the clothing.*

With these mechanical means you may conjoin respiratory gymnastics, which are also a useful element of cure in certain pulmonary affections, and particularly in old pleurisies. When the effusion has disappeared, there results, as you know, a diminution of capacity, which manifests itself by a deformity through life. To diminish this deformity, it is desirable to aid, as far as possible, the pulmonary parenchyma, so that it may regain the volume that it had before, and to attain this end, it is necessary by all means possible, to energize the respiratory functions, and mechanically to distend the pulmonary alveoli.

In pulmonary tuberculosis emphysema appears to be a favorable complication, in that it constitutes a barrier to the progressive invasion of the tuberculous ulceration; here, also, the distention of the pulmonary parenchyma may render you some service. You can attain this result by the aid of respiratory gymnastics.

These gymnastics may have application both to

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* Bazile Feris, Bull. de Ther., t. CV, p. 104, 1883.

the inspiratory and expiratory muscles, and to the lung itself. In their application to the muscles, it is, by combined movements. obtained by means of the ingenious apparatus of Pichery, or with the methodical processes of Laisné, that you can augment their contractile force. In reference to pulmonary gymnastics, there is a little measure, very easy of execution, for augmenting the respiratory capacity, suggested by Dally; after having made a strong inspiration, you should count with a loud voice, without taking breath; you may thus attain the figure of 30, 40, 50, or even 60. You can make use of all these means, and they will give you good results. I pass now to the consideration of the new medicaments of which I have spoken, euphorbia pilulifera, terpine, and terpinol.

The best antiasthmatic medication is surely that of which the basis is iodide of potassium, and when Greene in 1860, Aubrée in 1864, Trousseau in 1869, and, more emphatically still, Germain Sée in 1878, made known the happy effects of this remedy in the treatment of asthma, they rendered to medicine a signal service; you can, in fact, see any day in our wards cases illustrating the truth of this affirmation.

You know very well how we formulate this treatment; we begin by moderate doses of seven or eight grains and gradually increase them to forty, fifty, and even sixty grains a day. I was in the habit of ordering the iodide of potassium to be taken in milk, directing my patients at the same time to drink a great deal of milk during the day. We must, in fact, to prevent the accumulation of the medicament, favor its elimination by the urine. While continuing the usage of milk, I now think that the best vehicle for the administration of iodide of potassium is ale, which, in my opinion, disguises its taste better than anything else. You will then order the patient to take at meal-time, in a tumblerful of bitter ale, a dessertspoonful or a tablespoonful of the following solution:

℞ Iodidi potasii., ʒ iij.
Aquæ, ℥ vj.
M.

I sometimes add to the above tincture of lobelia, in the proportion of two or three fluidrachms to the entire quantity; if, however the lobelia causes nausea, it must be omitted from the prescription.

Despite all your precautions and all your endeavors to make the iodide palatable and well tolerated, there will be persons who cannot support it, and who cannot take it in the smallest doses without suffering many of the symptoms of iodism. Therefore succedanea to iodide of potassium have been sought for, and among these I must make special mention of *Euphorbia pilulifera*. This plant has been especially studied in our hospital service by Dr. Marsset.* Euphorbia pilulifera belongs to the great

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* Marsset: On Euphorbia Pilulifera, Therapeutic Gazette, Feb., 1885, p. 92; Thèse de Paris, 1884.

family of Euphorbiaceæ, which has furnished to medicine very energetic purgatives, such as croton tiglium and caper spurge; it is an herbaceous annual plant, growing in Brazil and other tropical countries, and in Australia; the specimens which served for our clinical experiments came from Queensland, Australia.

The active principle is an acrid resin which is soluble in water and dilute elcohol. When the aqueous extract or the hydro-alcoholic extract is administered to animals, such as frogs and guinea-pigs, it is observed that in the case of frogs this extract is toxic in the dose of ten to fifteen centigrams, which corresponds, nearly, to five grams of the dried plant to one hundred grams of the weight of the animal. In the guinea-pig the toxic dose is less; the animal succumbing to a dose of fifty or sixty centigrams of the extract, equivalent to about one gram of the dried plant per one hundred grams of the animal's weight.

When we come to inquire into its physiological effects, we note that it acts chiefly on the respiratory apparatus, and that to a period of acceleration succeeds a period of retardation of the respiratory movements and beatings of the heart; hence, it is propable that this medicine acts directly on the respiratory and cardiac centres.

Dr. Mattheson, in 1844, was the first to call attention to the action of euphorbia pilulifera in the treatment of asthma, and Dr. Tison, of France, was the first to ntilize this property in dyspnœas of asthmatic and even of cardiac origin.

From a pharmaceutical point of view, you may make use of the following preparations: (1) The hydro-alcoholic extract of the plant, which may be given in the dose of ten centigrams (one and two-thirds grains) a day; (2) or the decoction which Dr. Titson directs to be prepared by steeping half an ounce of the dried plant in two quarts of water; the dose to be three or four wine-glassfuls a day. (3) I am myself in the habit of using the tincture of euphorbia, of which I give ten drops three times a day. I recommend you to cause this preparation to be taken shortly before meal-time in a cup of some aromatic infusion, such as polygala or wall pellitory. You will thus avoid the local irritant action which characterizes almost all the extracts of this spurge. (4) There exists, lastly, a syrup made by Hetit, which contains five centigrams of the extract in each tablespoonful.

In patients suffering from dyspnœa, whether resulting from simple asthma, or from pulmonary emphysema, or even a cardiac affection, euphorbia has sometimes given us good results, but it will not do to give too large doses, and of the tincture, from five to ten drops, before each of the principal meals, are enough. Notwithstanding all these precautions, you will not be able to keep up this treatment more than a week without interruption, for the patients are apt to experience a burning sensation in the stomach, which results from the local irritant action of the medicament. It is, therefore, chiefly as a succedaneum of iodide of potassium, when the latter cannot be well borne, that you will resort to euphorbia pilulifera.

Terpine and terpinol fulfil indications absolutely different, and are applicable in catarrhs of the lungs. In my Clinical Therapeutics I have insisted on the great advantages which may be derived from copaiba in the treatment of pulmonary catarrh, but this medication can have but limited application; for, to say nothing of the repugnance which many people have toward copaiba, and its unfortunate association in the minds of most people with gonorrhœa (which increases the prejudice against it), there are certain unpleasant physiological effects often attendant on its use, such as eructations, diarrhœa, and divers cutaneous eruptions, which militate against the usefulness of this drug.

Therefore, while recognizing how happily copaiba modifies expectoration, it is only in hospital practice that I apply this excellent medicament to the treatment of pulmonary catarrh. I believe that I have found in terpinol a very fortunate substitute for copaiba, and one which offers all the advantages of the latter, without any of its disadvantages.

When turpentine is distilled in presence of an alkali, there is obtained a special hydrocarbon having for formula $C_{10}H_{16}$; this is *terebinthene*, which undergoes hydration, and thereupon furnishes a white, solid, crystalline body, which is the *hydrate of terebinthene*, or *terpine*. This terpine, in presence of an acid, such as sulphuric or hydrochloric, is transformed into an oily body, to which has been given the name of *terpinol*.

Terpine was employed for the first time in therapeutics by Prof. Lepine, of Lyons, and, as a result of experiments on man and animals, he found that this body might be with advantage substituted for turpentine, and that it acted as expectorant and diuretic; his dose of terpine is twenty to sixty centigrams (three to ten grains). We have reproduced in our service the trials of Prof. Lepine, and our pupil, Dr. Guelpa, has interested himself particularly in this undertaking. Terpine presents a real inconvenience in its slight solubility, requiring, as it does, 200 parts of cold water to dissolve one part of this substance; therefore, it is necessary to have recourse to alcohol in order to obtain active solutions; which is a drawback when one desires to prescribe it for diuretic purposes.

We have given terpine in much larger doses than M. Lepine; we have administered one, two, and even three grammes a day without obtaining any well-marken diuretic effect; so, in accordance with Tanret's suggestion, we have substituted terpinol for terpine.

Terpinol is an oily liquid body, which gives forth a very strong odor of tuberose (polianthus tuberosa), and especially of gardenia (cape jasmine). Adrian has made for me capsules with terpinol, each containing ten centigrams (one and two-thirds grains), and we give our patients six, eight, ten, and even twelve of these capsules a day. Terpinol may also be given in pill form, and here we give Tanret's formula, which can hardly be improved upon: Take of terpinol, benzoate of soda, of each, ten centigrams (one and two-thirds grains), sugar, q. s. for one pill. These pills contain the same quantity of terpinol as the capsules.

We have made several experiments on animals, and have noted: 1. The rapid elimination by the respiratory passages of terpinol, which long imparts its special odor to the breath; 2. Its feeble elimination by the urine, which also gives forth the odor of terpinol, though much less markedly than the breath.

We then made trials of terpinol in two orders of complaints, pulmonary catarrh and affections of the urinary passages. As might have been foreseen, it was in pulmonary catarrh that we obtained the best results, since it is chiefly by the pulmonary surface that terpinol is eliminated. The sputa become more fluid, their bad odor disappears, and expectoration is facilitated. In affections of the urinary organs, the results havs been almost nil. As a diuretic and modfier of the urine, it has shown itself very much inferior to turpentine.

So that if we were to attempt to classify these three substances, turpentine, terpine, and terpinol according to their therapeutic effects, we should say that for the catarrhal affections of the bronchi, terpinol deserves the first place, and turpentine the last, while in the case of catarrh of the urinary organs, the order is exactly the reverse. This completes what I have to say at present on the subject of new pulmonary medications.

In the next lecture I shall set fourth the therapeutic modifications which have resulted from the discovery of the tubercular bacillus.

APPENDIX TO CHAPTER VII.

QUEBRACHO. GRINDELIA ROBUSTA, YERBA SANTA. THE PNEUMATIC CABINET.

QUEBRACHO.

Aspidosperma Quebracho; synonym, Quebracho Blanco; natural order, Apocynaceæ; part employed, the bark; habitat, South America.

Pharmaceutical Preparations.—Report of Dr. Burgos, in a paper published in the Revista Farmaceutica and abstracted in Pharm. Journal, Dec. 20th, 1879, New Remedies (Therapeutic Gazette, August, 1880. p. 233.)—Dr. Burgos recommends several preparations of quebracho, which may, of course, be administered in substance. The infusion or the decoction, usually of the strength of one in tweuty. is improved by making it with the aid of a little sulphuric or acetic acid, whereby more of the alkaloid is extracted, and the resulting preparation is rendered much clearer. Tincture of quebracho is prepared by macerating one part of the bark in five parts of 50 per cent. alcohol for eight days, and filtering.

Compound Tincture of Quebracho: Quebracho bark, 2 parts; orange peel, 1 part; alcohol (56 per cent.), 5 parts.

Wine of Quebracho: Quebracho bark, 1 part; alcohol (56 per cent.), 2 parts; white wine, 16 parts. Leave the alcohol in contact with the bark for 24 hours, then add the wine; macerate for 8 days and filter. The author specially recommends San Juan or Mendoza wine, because either of them contains but little tannin, and possesses a special aroma which communicates an agreeable flavor to the preparation.

Elixir of Quebracho: Wine of quebracho mixed with a sufficient amount of sugar.

Extract of Quebracho: Both an aqueous and an alcoholic extract may be prepared.

Syrup of Quebracho: Quebracho bark, 3 parts; water, 32 parts; sugar, 16 parts. Boil the bark with the water, filter, and evaporate down to one-fourth; then add the sugar and make the syrup in the usual manner.

Preparations with the alkaloid. Aspidospermine or quebrachine is insoluble in glycerine. It dissolves readily in fats and fixed oils, and may be incorporated with cod-liver oil in larger proportion than quinine. The following is a suitable formula:

℞ Aspidospermine, 6 to 8 parts.
Cod-liver oil, 100 parts.

—*New Remedies.*

Physiological Action.—Report from Schikendanz, Sitzungsberichter Physico-Medical society, Erlangen, 1879, 17 Febr, and Bul kl. Wochenschrift 1879, No. 19, in article translated from Prager Medicinische Wochenschrift, Dec. 17, 1879, (Therapeutic Gazette, January 1880, p. 13.) Penzolt, whose communications for the first time called public attention to this subject, generally used the following formula for his experiments: 10.0 of the powdered bark, macerated eight days wish 100.0 alcohol, filtered, evaporated, dissolved in water, again evaporated to dryness and dissolved in 20.0 water. Experiments upon frogs with 0.5 of the bark gave complete motor-paralysis of central origin, with paralysis of the respiratory organs and diminished frequency of the heart beat (from 54 to 60 pulsations successively down to 8 to 10). This latter action was not caused "by irritation of the vagus." With rabbits 1.0 of the bark used hypodermically was followed by paresis of the extremities and difficulty of breathing; 2.5 caused death, preceded by paralysis of the voluntary movements, great dyspnœa and terminal convulsions (of dyspnœal origin?). Breathing was deepened and retarded. Changes in the frequency of the heart-beat occurred only upon intravenous injection, the blood-pressure reaching the former height after a temporary sinking of the same.

THERAPEUTIC EFFECTS.

Report from North Carolina Medical Journal; (Therapeutic Gazette, April, 1881, p. 160.) As unlikely as it seemed at first that the new drug quebracho (aspidosperma quebracho) could have any influence upon cases of dyspnœa, it seems now to be well established as true. "The dyspnæa of emphysema seems, from all accounts, to be most relieved by this drug; in that of phthisis, the effect is uncertain, as well as in œdematous conditions of the lungs associated with renal diseases, but some cases of cardiac dyspnœa, and even spasmodic asthma, have been benefited by it.

Report from Bellevue Hospital (Independent Practitioner, Therapeutic Gazette, Sept. 1881, p. 357.) "The results of recent experience with this drug have been confirmatory of its value in dyspnœa in all its forms. The fluid extract in doses of from twenty to sixty drops, every hour or two, as called for by the symptoms, has been found useful in our hands also, without regard to the exciting cause of the dyspnœa."

Report from City of London Hospital, for Diseases of the Chest, etc., J. B. Burkart, M. D., in British Medical Journal (Therapeutic Gazette, Aug., 1881, p. 238). "The liquid extract of quebracho has of late been largely employed in the treatment of asthma. As yet there are no indications for its use, except the presence of dyspnœa. A teaspoonful, repeated, if necessary, at intervals of ten minutes, certainly relieves, as I have observed, the dyspnœa of phthisis, of pneumonia, of pleurisy, of emphysema, and of valvular lesions. It has failed of its effect, so far as I have seen, only in two cases of aortic disease; in the one, the patient had been for years accustomed to inhale nitrite of amyl almost every two hours; in the other, there was complication with marked attacks of steno-cardia.

The active principle of quebracho appears to be a gum-resin; but as to its mode of action nothing is known. I have frequently noticed that, after the administration of the drug, there is slight flush of the face, perspiration, and occasionally drowsiness; but there are no objective signs on the part of the heart and of the lungs sufficient to account for the relief."

Report from New York Therapeutical Society (Therapeutic Gazette, 1881, p. 475).

Cases of Dr. R. T. Bangs, House Physician, St. Luke's Hospital (services of Drs. A. H. Smith and G. G. Wheelock):

"Case 1.—J. O., 28 years of age. Spasmodic asthma. Had used iodide of potassium, stramonium, nitre papers, nitrite of amyl, belladonna, chloral, etc., without much benefit. Fluid extract quebracho, ♏xx, were administered, t. i. d., and afforded immediate relief—so much so, that the patient left the hospital in a few days, provided with a prescription for the drug.

Case 2.—42 years of age. Aortic aneurism. This was a man upon whom treatment with an Esmarch bandage was twice employed, under ether, for the cure of a popliteal aneurism. The first time the bandage was left on for an hour and a half, and the second time for two hours. After the bandage had been removed, a tourniquet was each time applied to the femoral artery for an hour. Both these attempts proved unsuccessful. Treatment by flexion was next tried, but was also of no avail. Finally ligature of the femoral cured the popliteal aneurism. While the patient was under ether, it was noticed that he was very cyanotic, but when the effect of ether had passed away, the cyanosis also disappeared. Ten days after the femoral had been ligated the patient devoloped dyspnœa. Fluid extract of quebracho was given, ♏xv t. i. d., and gave much relief. He remained in the hospital twenty-seven days longer, during which time the quebracho continued to benefit his dyspnœa. Fifteen days later he was re-admitted with some dyspnœa; ʒ ss t. i. d. relieved him again. After taking it for two weeks the use of the drug had to be stopped because no more of it could be obtained. For a fortnight he took other remedies with but little and temporary benefit. At the end of that period the use of quebracho was resumed, ʒ ss t. i. d. By this time the patient was markedly cyanotic, and his dyspnœa was almost continuous. The dose was increased to ʒ ss every four hours, but no benefit resulted. The patient died, and at the autopsy a large aneurismal tumor was found pressing upon the trachea, very much narrowing the lumen of that tube.

Case 3.—H. B., 48 years of age. Spasmodic asthma of many years' standing. Fluid extract of quebracho, ʒ ss t. i. d., was at once prescribed, and gave marked and permanent relief.

Case 4.—F. L., 70 years of age. Cardiac disease. Fluid extract of quebracho, ʒ ss t. i. d., given with some slight benfit. Patient died ten days after the administration of the drug had been begun."

Report from New York Therapeutical Society. (Therapeutic Gazette, 1881, p. 475.)

Cases observed by Dr. A. H. Smith.

"Case 1.—Mrs. C., aged 65. Long-standing mitral regurgitation, with pulmonary œdema and hydrothorax; orthopnœa; respiration very rapid and catching; lips livid. Two doses ♏xl Squibb's fluid extract quebracho were given without any noticeable relief. So much nausea was caused by the medicine that its use was abandoned. In this case digitalis had ceased to give relief.

Case 2.—C. H., male, 36, patient at Presbyterian Hospital. This was a case of asthma, complicated with old pleuritic adhesions and with a recent attack of acute articular rheumatism. The dyspnœa came on in paroxysms of great severity. Wnen the first dose of quebracho was given, March 10, 1881, the patient was sitting up in bed, his face purple, lips livid, breathing very labored, shoulders elevated with each inspiration. ℞xl of Squibb's fluid extract were given, and in fifteen minutes there was perfect relief, which lasted, however, only twenty minutes, when the difficult breathing returned. Another dose was then given, from which complete relief was obtained, lasting an hour. For the next twenty-four hours the attacks were less severe. On the following day, March 11, the dyspnœa not being urgent, a dose of ℞xl was given, and the effect upon the respiration was observed. In fifteen minutes it had fallen from 27 to 20. At the time of these observations the patient was taking gr. x of salicylic acid, and ʒ ss of dialysed iron, t. i. d. The dyspnœa not recurring, the quebracho was discontinued."

The following conclusions seem justified from the trials made with quebracho:

1. That quebracho has proved an excellent, though but temporary remedy against the dyspnœa caused by emphysema, bronchial catarrh and pleuritis.

2. That it has been followed, after using it several days (up to nine days), by no disturbance of digestion, or of the heart beat, by no motor paralysis or weakness, nor other deleterious effects.

This new remedy may therefore justly be recommended for further trial, and would make a very desirable addition to the materia medica, even if its benefits are restricted to the more temporary relief of distressing dyspnœa. As the experiments on animals mentioned in the beginning of this article show, care in the administration of this drug is to be recommended. Nothing is definitely known as to the mode of action of quebracho.

GRINDELIA ROBUSTA.

Synonym, Hardy Grindelia; part employed, the leaves and flowering tops: natural order, Compositæ; habitat, California.

Preparations.—**Fluid extract of the leaves and flowering tops: dose, ½ to 1 fluidrachm (2 to 4 C. c.)**

Solid **extract: dose, 5 to 18 grains.**

Elixir **grindelia robusta; each fluidounce represents 2** drachms of **grindelia robusta; dose, 2 to 4 av. fluidrachms.**

Pil. ext. **grindelia robusta, 3 grs.; dose, 1 to 3 pills.**

Attention **was first called to the therapeutic value of** grindelia robusta **by Dr. H. Gibbons, of San Francisco. Be**lieving that **a remedy which in the hands of so acute an ob**server had **produced such remarkable results deserved to be** better known, **Parke, Davis & Co. prepared a fluid extract** according to the method recommended by Dr. Gibbons, and thus brought the remedy within the reach of physicians in the Eastern States. It is mainly through this action on their part that "this medicine," to quote the U. S. Dispensatory, 15th edition, "has gradually worked its way into favor" so that it now holds a place in the United States Pharmacopœia.

As a local application, grindelia has been employed with asserted advantage in burns, vaginitis, genito-urinary catarrh, etc., applied either in the form of a poultice or in a solution. We may add that in California, grindelia is regarded as a specific in the treatment of poisoning by rhus toxicodendron.

From the last edition of the U. S. Dispensatory we quote the following account of the therapeutic properties of the drug: "Its chief use has been in asthma and bronchitis; it is especially valuable in the latter complaint when there is much dyspnœa and a distinct tendency to bronchial spasm. The drug, however, also stimulates the bronchial mucous membrane, and it may be confidently exhibited in chronic bronchitis, especially of the aged. It has been employed with asserted success in whooping cough. Its active principles appear to be excreted by the kidneys; hence, large doses sometimes produce renal irritation, and in chronic catarrh of the bladder, good has been effected by its stimulant influence upon the mucous membrane of the viscus.

REPORTS FROM HOSPITAL PRACTICE.

1.

Report from Charity Hospital, Blackwell's Island, New York. (Therapeutic Gazette, 1881; p. 87.) Asthma, two cases, slight improvement. Bronchitis, two cases, no improvement. In cough of phthisis it was followed by some benefit.

2.

Report from Dr. Wallace, Superintendent Texas State Lunatic Asylum. (New Preparations, 1879, p. 85). [This report, which is too long for reproduction, shows the remarkable benefit which attended the use of grindelia in frequent (20 drop) doses, in an obstinate case of spasmodic asthma of twenty years standing].

3.

Report from Charity Hospital, Blackwell's Island, N. Y. (New Remedies, New preparations. 1879, p. 99). Grindelia robusta, the remedy which has been introduced in the treatment of spasmodic asthma, has been used at the Charity Hospital, New York, with favorable results, but in a manner different from what might have been expected. It was supposed that if the agent relieved the spasmodic condition in asthma it might prove of service in the cough of phthisis, and for this purpose it was given to a large number of patients in the medical wards. It was also administered in a case of asthma. In the asthmatic patient no benefit was obtained, but in the phthisis cases considerable relief to the distressing cough was noticed in the majority of cases.

[redacted]

YERBA SANTA.

Eriodyction glutinosum, Benth.; synonyms, holy herb, saint herb, Bear's weed, consumptive's weed; part employed, the leaves; natural order, Hydrophyllaceæ; habitat, California and Mexico.

Preparations.—Fluid extract of the leaf; dose, ¼ to 1 fluidrachm (1 to 4 C. c.).
Solid extract; dose, 3 to 12 grains.
Syrup yerba santa comp.;* dose, 1 to 4 fluidrachms.
Glycerole yerbine comp.; dose, 1 to 3 fluidrachms.
Glycerole yerba sant; dose, 1 to 2 fluidrachms.
Lozenges yerba santa comp.; dose, 1 to 2 every three hours.
Pil. yerba santa ext., 3 gr.; dose, 1 to 2.
Yerba santa with malt extract; dose, 2 to 4 fluidrachms.

The following extract from a paper read by John Calvert, before the California Pharmaceutical Association, and published in the Pharmacist and Chemist, May, 1883, defines the application of yerba santa so closely that we reproduce it, in lieu of a statement collated from current medical literature:

"It is often used instead of tobacco, the smoke being inhaled, and giving relief in asthma. The fluid extract, in doses of from fifteen drops to a teaspoonful, also affords relief in that complaint. The natives have long esteemed it as endowed with rare value in all diseases of the respiratory organs. They claim that the worst case of consumption can be cured by a tea made of this plant. While such an estimate is at variance with

* This preparation is composed of yerba santa and a number of aromatics. It is chiefly employed as an excipient for the administration of quinine, the taste of which it very effectually disguises.

medical experience, there seems to be no doubt that it is a valuable remedial agent in chronic bronchitis, pneumonia, phthisis, chronic gastric catarrh, in hemorrhoids and chronic derangement of the kidneys. It blends astringent, demulcent, tonic, sedative and balsamic properties. The latter seems to depend upon a resinous principle in which it is quite rich. This resinous property exerts upon the mucous surface a decidedly soothing and alterative effect. Under its use the cough is soon mitigated, the expectoration becomes less abundant, the appetite improves, the food is better digested and assimilated, the flesh and strength are regained, and frequently cases which have not been benefited by previous treatment are rapidly restored to health. There is a disease much overlooked—paralysis of the bronchial muscles—in which yerba santa is said to play an important part. It relieves the congested or thickened epithelium, and the patient can breathe freer. In aphonia (tubercular) it relieves at once. It seems to be a direct restorative drug in diseases of the respiratory organs. One of the most remarkable properties of yerba santa is its power of completely destroying the bitter taste of quinine, and the drug is very often prescribed with reference to this property alone."

Report from the Therapeutic Gazette, Nov., 1881, p. 469: This herb has long enjoyed a local reputation as a remedy for coughs and colds among the residents of the sections in which it is found. It also entered very largely into a proprietary cough medicine, for which extraordinary cough virtues were claimed. It was, however, first introduced to the medical profession in 1875, since which time it has enjoyed a quite extensive trial, and has been steadily growing in favor. It operates as a demulcent and expectorant, and is especially applicable to chronic subacute inflammation of the bronchial mucous membrane, such as bronchitis attended by bronchorrhœa. Its action in such cases is similar to the combined action of ipecac and balsam of Peru, its stimulating properties preponderating. The following is an excellent combination:

[redacted]

℞ Potassii iodidi, ʒ jss.
Ext. yerbæ santæ fluidi, ℥ ij.
Ext. grindeliæ robustæ fluidi.
Syr. pruni Virginiani, āā ℥ j.
M. Sig. A teaspoonful every four hours.

In the acute laryngitis of children (so-called false croup), yerba santa may be added to other remedies with advantage.

℞ Ext. yerbæ santæ fluidi, ʒ iij.
Sodii carbonatis, grs. xij.
Glycerinæ, ℥ j.
Aquæ cinnamomi, ℥ jss.
Mix. Sig. For a child two years of age, a teaspoonful every two hours.

The influence of yerba santa on the mucous membrane of the respiratory passages, suggested its use in catarrhal troubles of the genito-urinary tract, and it has been given with benefit in such affections.

Administration.—Of the solid extract, 5 to 10 grains; of the fluid extract, 20 drops to a drachm.

THE PNEUMATIC CABINET.*

ITS VALUE IN THE TREATMENT OF BRONCHIAL AND PULMONARY DISEASES.

"Phthisis has been cured by the topical application of appropriate remedial agents."

Until within about thirty years pulmonary consumption was almost universally regarded as an incurable disease. Indeed, it was only the occasional

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*Written for this work by W. Everett Smith, M.D. (Harvard), Boston, Mass., Fellow of the Massachusetts Medical Society; Member of the American Medical Association; formerly Asst. Physician to the Massachusetts Home for Intemperate Women.

discovery of hardened masses and cavities that had healed over in the lungs of patients that had died of other diseases, that gradually led the medical world to believe that consumption could ever be cured. The possibility of a cure in lung diseases being then conclusively established, the causes of these diseases began to be more carefully studied, with the hope of finally discovering some treatment directed to their removal.

All the methods that have been used hitherto may have their measure of value, but all have failed to work the desired cure, because they were not founded upon a practical and physiological basis; for it is one of the soundest maxims of medicine, says Dr. Austin Flint, that the indications for medical treatment derived from science and from nature should harmonize, and be in accordance with the dictates of common sense.

Theory of the treatment.—Adequately, then, to combat disease, it is necessary thoroughly to understand the functions and requirements of health; and it is suggestive of the value of the treatment of lung diseases by the pneumatic cabinet that *its development is in harmony with and depends upon physiological principles.* The life of lung tissue depends upon pure air; any interruption or irregularity in this supply means the beginning of lung disease.

The first symptoms of cough, expectoration, whether streaked with blood or not, pain in the chest,

[redacted]

long-continued huskiness of voice or hemorrhage, slight in degree though they may be, and often disregarded, are always signs of danger—signs of some unhealthy process either in the bronchial tubes or in the lung itself. A certain portion of the air-passages is irritated or inflamed, and this irritation, if allowed to run unchecked, will oftentimes end in far more serious trouble.

For example, in acute bronchitis, or a "cold," as it is commonly called, as well as in chronic bronchitis, the bronchial tubes are inflamed, swollen, and clogged with a sticky secretion more or less difficult to expel by acts of coughing. So in whooping cough, a disease that not infrequently leads to the development of consumption, the bronchial inflammation is always a very prominent symptom. In asthma, too, there is always a marked bronchitis, together with a dilatation of the air-cells themselves (emphysema), which directly hinder the act of respiration and result in a distressing and serious, although not positively dangerous, affection, *unless* an acute bronchitis or pneumonia should occur.

In pleurisy, the presence of water in the cavity of the chest compels the lung to occupy a much smaller space than is natural to it. The lung cells cannot expand, and gradually become closed to the entrance of air, if the pleurisy be of long duration. In pneumonia, on the other hand, certain of the air-cells themselves are intensely inflamed, and so filled with blood that they become consolidated or solidified, resembling flesh in appearance, and are perfectly impervious to air. These inflamed portions of lung are then utterly unfitted for respiratory and aerating purposes, and if the pneumonia become a chronic affair, may possibly never regain the power of properly expanding, unless some means are used to aid the powers of nature.

During all these inflammatory processes in the lung tissue, the act of breathing becomes an effort, the blood is imperfectly purified, strength and flesh are lost, and the whole system suffers. If, moreover, in addition to the actual bronchial or lung disease in progress there be any inherited tendency to pulmonary weakness, together with a flat and undeveloped chest, the most favorable conditions exist for definite and serious lung trouble. The germs of disease find a portion of lung or bronchial tube that is weak, inflamed, and kept at rest. This is a quiet home for them, a fertile soil in which to grow and multiply, and they improve their opportunity.

In all this loss of health, however, the patient himself, as a rule, is hopeful; he says he has always, from childhood, been subject to "taking cold;" he is positive that this present trouble is merely temporary, and far from serious; that the cough is simply "bronchial;" that the blood very likely comes from the nose or the back of the mouth; that the pain in the chest is nothing new, but is due merely to a temporary "cold," and that flesh and strength will soon return. *In this very delay lies the greatest danger.* Too late he recognizes that the *golden* opportunity for a *speedy* recovery has passed, and that he must now *struggle* to regain his health and prevent the further ravages of the disease.

Whenever, then, the mucous membrane of the bronchial tubes is swollen and inflamed, as in bronchitis, "bronchial attacks," whooping cough, and asthma, and whenever lung tissue is consolidated or solidified, as in consumption, chronic pleurisy, and pneumonia, the life and healthful activity of the respiratory system is seriously impeded.

To soothe these inflamed portions of the lungs, to expand the consolidated portions, and at the same time to deposit remedial and antiseptic agents in cavities as well as upon the weak and over-sensitive lung cells and bronchial tubes, is the method and the theory of the treatment of lung and bronchial diseases by the Pneumatic Cabinet.

BRIEF HISTORY OF PNEUMATIC TREATMENT.

For many years the topical or pneumatic treatment of lung diseases has periodically occupied medical attention. In 1835 M. Junod made the first authentic experiments with compressed air upon the human body,* but it was not until 1850 that

*Séances de l'Academie de Sciences Août, 1835.

definite treatment of patients in chambers of rarefied or compressed air was undertaken. In the period from 1830 to 1857 we find records of cases of emphysema successfully treated by Tabarié,* Bertin of Montpellier,† Pravaz‡ and Millet of Lyons, A. Simpson§ and others. In 1870, Hauke,‖ of Vienna, devised a portable apparatus for therapeutical uses, a tub or bath which imperfectly removed atmospheric pressure from the surface of the body. His studies are said to have stimulated Waldenburg to devise the cylinders for compressed air which are so well known to the profession.¶

In 1884 Dr. J. Solis-Cohen,** of Philadelphia, devised a modification of the apparatus of Waldenberg, and has since recorded results of many successful treatments. But none of these devices, excepting Hauke's Wärme or tub attempts to remove atmospheric pressure from the surface of the body in order to

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*See Walshe, p. 333, London edit., 1871.

†Du Bain d'Air Comprimé.

‡Emploi Medicale d' Air Comprimé.

§Compressed Air as a Therapeutic Agent, 1857.

‖Ein apparat zur Künstlichen Respiration und dessen anwendung zu Heilzwecken. Wein, 1870.

¶Berlin Klin. Wochenschrift, s. 39, 40. Waldendurg, Hirshwald: Die Pneumatic Behandlung de Respiration und Circulation Krankheiten. Berlin, 1875.

**New York Medical Journal, Oct. 18, 1884: Compressed and Rarefied Air as a Substitute for Change of Climate.

render respiration fuller and deeper than is possible under ordinary atmospheric conditions. Early in 1883, however, Dr. Herb. F. Williams, of Brooklyn, N. Y., began the systematic study of the topical or local application of appropriate remedial agents to inflamed and diseased lung tissue. Recognizing the value and necessity of removing external atmospheric pressure from the peripheral circulation of the whole body in order to withdraw blood from internal viscera to the surface of the skin, to increase the capacity of the chest, dilate the lung cells, re-open collapsed alveoli and compress or restrain the capillary lung circulation, he called in the practical assistance of Mr. Joseph Ketchum. Together they developed the Pneumatic Cabinet, or, as it has been called, the Pneumatic Differentiator.

DESCRIPTION OF THE PNEUMATIC CABINET.

This cabinet is practically an air-tight iron safe, about 5 feet high, 2 feet wide and 2½ feet deep; large enough in fact for a patient to sit in. In the rear is a door fitted with bolts but opened or closed by a single turn of the hand.

In front is a large plate glass window through which passes a guttapercha tube having a stop-cock upon the outside, and ending in a trumpet-shape for receiving the medicated spray. Below this guttapercha tube is a shelf to hold the atomizing apparatus and medicine cup. That portion of the spray that condenses on the patient's side of the stop-cock flows out of the tube through a drip hole into a receiver, while the spray which condenses in front flows back into the medicine cup and is re-used. Within the cabinet the gutta-percha tube projects far enough to allow a flexible rubber breathing tube to be slipped on. This breathing tube is so shaped that its mouthpiece presses against the patient's teeth, and is held in position between the teeth and lips. Each patient has a breathing tube reserved for his individual use, and these tubes when not in use are kept immersed in jars filled with a two-per-cent. solution of carbolic acid. In the front of the cabinet there is a second faucet with a stop-cock so that the rarity or condensation of the interior of the cabinet can be decreased whenever advisable, without the removal of the breathing tube from the patient's mouth. In front and over the glass window is a U-shaped barometer graduated in tenths of an inch, and connected with the interior of the cabinet. Upon the top of the cabinet is a bellows which communicates with the interior of the cabinet by a valve, and is worked by a simple lever. Its capacity is approximately one-thirtieth of the cubic capacity of the cabinet.

The patient, before entering the cabinet, is told that respiration is to be wholly through the breathing tube, and that to secure the perfect expansion of the chest the nostrils must be held closed by the fingers, or by a clamp if preferable. He is told, too, that the process of respiration is reversed, so that while air will rush into the chest without any voluntary effort on his part, he must forcibly blow it out preparatory to the next inspiration; and he is advised if he feels the least discomfort in the ears while the air is being exhausted to swallow once or twice in order to open the meatus of the Eustachian tube, and thus equalize the atmospheric pressure within and without the internal ear.

The patient now enters the cabinet and seats himself upon a revolving chair adjusted to the proper elevation. A rubber cloth is arranged to protect the clothing from any possible condensation of the vapor, and a spit cup is placed within the cabinet. The door is closed and the air is rarified by a slow and regular movement of the air-pump or bellows until the difference between the levels of the two columns of mercury in the barometric gauge indicates a rarefaction of from one inch to an inch and a half. Within this rarefied atmosphere the patient is allowed to breath a few moments until the residual air within the lungs has in a measure been expanded. The rarefaction is now decreased by allowing outside air to rush into the cabinet through the second faucet I have mentioned, until the gauge indicates the amount of rarefaction to which it is proper to submit the patient during the inhalation of the medicated spray. This degree of rarefaction varies according to the patient, but is usually that represented by a barometric fall of from one-tenth of an inch to an inch, each tenth of an inch being equivalent to an altitude of 100 feet as regards the removal of atmospheric pressure from the chest walls.

The following table will give the approximate equivalents of the changes produced by these rarefactions of the air:

Fall of barometer in inches.	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.
Equivalents in parts of an atmosphere........	1-300	1-150	1-100	1-75	1-60	1-50	7-300	2-75	3-100	1-30
Equivalents in pressure (lbs. per square inch).	.05	.10	.15	.2	.25	.3	.35	.4	.45	.5
Equivalents in altitude in feet..................	100	200	300	400	500	600	700	800	900	1000
Equivalents in inflating pressure; lbs. per area ten inches square, front and back.	10	20	30	40	50	60	70	80	90	100
Equivalents in energy developed in expiration (lbs.).............	10	20	30	40	50	60	70	80	90	100

The patient now inserts the breathing tube in his mouth and compresses the nostrils to prevent the escape of air through the nose. The stop-cock in the guttapercha tube is opened and the outside air of the room rushes into the lungs, carrying with it the medicated spray which is atomized either in a Semple's atomizing inhaler by a cylinder of compressed air, or by the ordinary steam atomizer. The effect is a *forced involuntary inspiration* followed by a *forced*

[redacted]

*voluntary expiration.** These respiratory movements are continued for several minutes under the watchful care of the operator. Upon the least fatigue the stop-cock is closed, the patient removes the tube from the mouth and breaths the rarefied air of the cabinet until ready for another application. During these intervals of rest, I think it a good plan to rarefy the air again to the extent of an inch or an inch and a half, both to exhaust vitiated air from the closed cabinet and to aid in expanding residual air within the lungs. The treatment varies in duration from ten to thirty minutes, and is repeated either daily or at intervals of two or three days, the number of applications varying; the greatest number thus far recorded being 105, a case of acute catarrhal phthisis, in Dr. Williams' practice, which recovered.

VALUE OF TREATMENT.—The peculiar value of this treatment lies in the combination of the medicated spray with the increased strength of the respiratory movements. A much fuller expansion of the chest is produced than is possible by an ordinary full inspiration, and at the same time the medicated spray being carried to the very deepest and most remote portions of the lungs with much greater force than by a natural

* In ordinary breathing, on the contrary, the act of inspiration is voluntary, *i. e.*, accomplished by more or less effort, while expiration is involuntary and passive, *i. e.*, a simple elastic contraction of the chest.

inspiration, is deposited upon the bronchial tubes, even the smallest of them, as well as in cavities and other diseased and inflamed portions of the lungs.

The materials, however, which have been found most useful as inhalations are not mere gases which are mingled with the inspired air and then pass out with it, but they are vapors of soluble bodies which are deposited upon lung tissues. Upon every moist bronchial tube, upon the walls of cavities and around, if not within, the areas of inflammation, the inhaled vapor is condensed to render the soil barren for germ growth, to impregnate lung cells and bronchial mucous membrane with antiseptic material, which we know renders them less fitted for the cultivation of germs, so that finally we may be able to supply the vital activity which is lacking in those parts, and prevent the progress of disease.

The following are some of the formulæ which I have proved useful as inhalations:

℞ Liq. iodinii comp., ℥ ss–ii.
Glycerinæ, ℥ iii.
Aquæ, ℥ xiii.

M.

℞ Liq. iodinii comp., ʒ i–ii.
Ac. carbolici (cryst.), ʒ ss.
Ext. hamamelis, fl., ℥ iv.

M.

℞ Tinct. benzoin. comp., ℥ i.
Glycerinæ, ʒ ii.

Calcii phosph., q. s.
Aquæ, ad ℥ viii.

M.

℞ Creasoti, gtt xxx.
Glycerinæ, ℥ iii.
Aq. camphor., ℥ xii.

M.

℞ Phenyl, ʒ ii.
Glycerinæ, ℥ iii.
Aquæ, ℥ xiii.

M.

℞ Hydrarg. chlor. corros. r viii
Glycerinæ. ℥ iii.
Aquæ, ℥ xiii.

M.

℞ Hydrarg. chlor. corros., gr. ii.-iv.
Ammon. mur., ʒ i.
Glycerinæ, ℥ ii.
Aquæ, ad ℥ viii.

M.

℞ Ammon. mur., ℥ ss.
Glycerinæ, ℥ ii.
Aquæ, ad ℥ viii.

M.

℞ Potass. brom., ℈ ii.
Ext. humuli fl., ʒ iii.
Glycerinæ, ℥ i.
Aquæ, ad ℥ viii.

M.

℞ Tinct. hyoscyami, ℥ iss.
Tinct. opii camph., ℥ i ʒ ii
Ext. conii fl., ʒ ii.
Glycerinæ, ad ℥ iv.

M.

℞ Ol. eucalypti, ʒ i
Petrolati (fl.), ℥ i.

M.

℞ Ol. picis liq., ʒ ss.
Petrolati (fluid), ℥ i.

M.

℞ Ac. carbol. (cryst.), gr. x.
Petrolati (fluid), ℥ i.

M.

℞ Oil pine needles, ʒ ss.
Fluid cosmoline, ℥ i.

M.

℞ Phenyl, ʒ ss.
Petrolati (fluid), ℥ i.

M.

The last five formulæ can be used only with the Semple Inhaler,* being too dense to be vaporized in an ordinary atomizer. The great objection to all methods of inhaling atomized fluids under ordinary atmospheric pressure has been the rapidity with which

* Manufactured by Parke, Davis & Co., Detroit, Mich. Price, $5.00.

the vapor condenses, either upon the inhaling tubes or upon the mouth and pharynx. Indeed, I have proved by actual experiments upon animals that, practically, none of such vapor penetrates beyond the glottis, or vocal cords. By using, however, an inhaler made upon the principle of Semple's, and a heavy menstruum for the medication which is to be atomized, the resulting vapor seems like smoke, and will remain in vapor without condensation for a period of from ten to twenty minutes.

But it can also be demonstrated by experiment that even such vapor as this will not penetrate to ultimate (much less to diseased) air cells in any amount unless the patient is surrounded by a rarefied atmosphere and is breathing air at normal pressure, i. e. under relative compression. Hence all apparatus which seeks to dispense with an air-tight cabinet, such for example as the atomizer recently introduced to the profession by Dr. Evans* (which is nothing more or less than a Semple's Inhaler without a cabinet), are imperfect in action and fail to medicate thoroughly the lung tissue, especially if it be diseased and unable to expand under ordinary respiratory efforts.

EFFECT UPON CHEST CAPACITY.

I insist, therefore, that we must not neglect to

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*The Local Treatment of Pulmonary Phthisis by a New Instrument, by Geo. A. Evans, M. D. New York Medical Journal, March 6, 1886 consider the beneficial effects of removing the external pressure of the atmosphere from the chest walls. The active and passive movements of the respiratory act being reversed, the breathing takes place not merely with the *tidal* volume of air (which is carried by ordinary inspiration only to the larger bronchial tubes, reaching the lung-cells in obedience simply to the law of the diffusion of gases), but also with the much larger volume of *complemental* air.* When properly conducted, therefore, a gymnastic action is produced, which expands and strengthens not only the diseased, but even the healthy, although undeveloped, chest, and which is beneficial from a mere hygienic standpoint. Indeed, careful tests before and after a course of treatment, have demonstrated an increase in the capacity of the chest of from twenty-five to one hundred per cent., and a corresponding development both of chest measurements and chest expansion.

I have called this increased action of the chest gymnastic, but I do not mean that its beneficial effects are solely seen in the development of the muscles of the chest walls. On the contrary, it is the

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The *tidal* or *breathing volume* of air is that air which passes in and out of the lung with each ordinary breath. It amounts only to about twenty-five cubic inches. The *complemental* air is that amount which can be taken into the lungs by forced breathing *in addition* to the *tidal* volume, and amounts to about 100 cubic inches.

mucous membrane of the bronchial tubes and of the lung-cells that is strengthened and invigorated, while the lung-cells themselves are expanded and stimulated into a more vigorous and healthful activity.

EFFECT UPON COUGH AND EXPECTORATION.

The effect of the inhalations upon the cough and expectoration depends not only upon the progress that disease has made upon the lungs, but also upon the choice of remedies that are to be inhaled. In nearly every case, however, that I have treated there has been noticed a marked decrease of both of these symptoms, although at first the expectoration may be somewhat increased. This increase is due to the fact that the removal of the external pressure has caused such an expansion of air in the bronchial tubes as to forcibly expel secretions, which may have so accumulated as seriously to impede the proper expansion of the air-cells.

EFFECT UPON HEMORRHAGE.

Finally, the influence of this treatment upon the circulation is very instructive and worthy of the most careful study. In brief, we may say, without entering into a scientific discussion of the subject, that the blood-pressure in the large vessels is increased, but that the pressure in the small blood-vessels or capillaries of the lung cells and bronchial tubes is so far decreased as *actually to decrease the* *liability to pulmonary or bronchial hemorrhage, and in some cases even to arrest the hemorrhage during the attack.* This modification of the capillary blood-pressure can scarcely be other than beneficial to any inflammatory process in the lung tissue.

The danger, however, should not be overlooked that with old pleuritic adhesions, fatty hearts, aneurismal dilatations, atheromatous arteries and denuded arteries lying in cavities of the lungs, the most serious or even fatal injury might be done by a careless or ill-advised use of the Cabinet. Yet this so far from being an argument against the value of the treatment is, in fact, a direct argument in favor of its power over lung expansion.

SUMMARY OF EFFECTS.

To sum up briefly the effects of this treatment in the cabinet: The fever, cough, expectoration, and tendency to hæmorrhage are all decreased, while the appetite, strength, weight, and vigor of voice, are increased to a marked degree. So, too, there is a disposition to a more restful and refreshing sleep.

An increased amount of oxygen is absorbed by the system, giving better blood, firmer tone to the heart, and greater strength and regularity to the circulation. The withdrawal of atmospheric pressure from the surface of the body promotes also the healthy secretions of the skin, and reduces blood pressure in the liver and kidneys. This reduction of pressure in these organs, which are so prone to disease caused by over-distension with blood, allows them to resume their proper functional activity. On the other hand, the unhealthy and weakening secretions, the so-called night-sweats, disappear as a rule, owing to an increased tone and vigor in the sweat-glands.

DISEASES THAT ARE BENEFITED BY THIS TREATMENT.

Thus far the greatest value of this method in the cases that have fallen under my care has been in the treatment of consumption at all stages, but especially in the early stages, acute and chronic bronchitis, asthma, emphysema, the chronic remains of whooping-cough, and the consolidations resulting from an old pleurisy or pneumonia. It is useful also as a hygienic exercise, to expand a comparatively healthy but undeveloped chest.

To treat these various diseases successfully, an ingenious mechanism permits the operator at will either to rarefy the air within the cabinet to a given degree, or to condense it to a given degree, or alternately to rarefy and condense it, rarefying it with the act of inhalation, and condensing it with the act of exhalation, thus causing a vigorous artificial respiration.

Although the clinical reports of this treatment that have been made thus far by different observers have certainly given proof of the possibility of recovery from the most serious of lung diseases, even after cavities have been formed, we should not allow an inconsiderate enthusiasm to prevent us from fairly weighing evidence which must in all justness be impartially considered. There may be cases, and probably are periods in the history of cases, when the pneumatic treatment is of very little value, if, indeed, not positively inapplicable. On the other hand, there can be no doubt that it has been the means of restoring to health many patients whom other methods of treatment have utterly failed to help.

It does not interfere with any of the medicinal and nutritive measures that have been proved already to be of value, nor does it supersede the advantages for many patients of a change of climate. For some patients it may be used only in combination with, and as an adjunct to, these other methods of treatment; for others it will prove in itself the wisest and most efficacious treatment by far that can possibly be employed. For all it is a valuable method of *home* treatment, has taken a legitimate place in therapeutics, and claims a careful and unprejudiced trial and investigation.

In order, however, that the cabinet shall be in the hands of none but those who are competent to judge of its value and discriminating enough to use it wisely and prudently, the most careful precautions have been taken by the inventors. After consulting with eminent practitioners they decided to take letters of patent and to form the Pneumatic Cabinet Company, with offices at 252 Madison Ave., New York, under the superintendence of Mr. Jos. Ketchum, the inventor. The cabinets are never sold, but are leased under contract to "physicians of known skill and integrity" at an annual rental of $250.; and to guard against the instruments falling into the hands of charlatans, each applicant must be recommended and approved by the Committee on Licenses, consisting of Drs. Albert L. Loomis, of New York, and Herbert F. Williams, of Brooklyn.

BIBLIOGRAPHY.

Ziemssen. Handbuch der allgemeinen Therapie. Bond I. Theil IV. Edited by Œrtel 1882.

Hassall. Inhalation Treatment of Organs of Respiration, including Consumption. London. 1885.

Herb. F. Williams. Antiseptic Treatment of Pulmonary Disease by means of Pneumatic Differentiation. Medical Record, Jan. 17, 1885.

Journal of the American Medical Association. Editorial. Feb. 14, 1885.

Vincent Y. Bowditch. The Treatment of Pulmonary Diseases by Means of Pneumatic Differentiation. Boston Medical and Surgical Journal, July 16, 1885.

Herb. F. Williams. Pneumatic Differentiation. New York Medical Journal, Oct. 3, 1885.

Alfred S. Houghton, and P. C. Jensen. Pneumatic Therapeutics, with Editorial Comments. Jour- of the American Medical Association, Nov. 7, 1885.

W. Everett Smith. The Rational Treatment of Pulmonary Diseases by the Pneumatic Cabinet. Ibid, Nov. 14, 1885.

E. Tiegel. The Physiological Action of the Differential Pneumatic Process on the Circulation. Ibid, Nov. 28, 1885.

Joseph Ketchum. The Physics of Pneumatic Differentiation. Medical Record, Jan. 9, 1885.

E. Darwin Hudson. Present Status of the Pneumatic Treatment of Respiratory Diseases. Ibid, Jan. 9, 1886.

F. Donaldson, Jr. The Pneumatic Cabinet and Pneumatic Differentiation. Maryland Medical Journal, Feb. 13, 1886.

W. Everett Smith. The Rational Treatment of Bronchial and Pulmonary Diseases by the Pneumatic Cabinet. Medical and Surgical Reporter, Feb. 20, 1886.

CHAPTER VIII.

ON ANTISEPTIC PULMONARY MEDICATION.

GENTLEMEN: One may affirm, without fear of being accused of exaggeration, that antiseptic pulmonary medication, such as we may ideally imagine it to be, is destined to have a high place in the therapeutics of the future. In fact, in all that concerns the contagion of diseases, the air is the most important factor, and whoever shall succeed in depriving the atmosphere of its germs, will render the greatest possible service to medicine and hygiene.

Thanks to the brilliant discoveries of Pasteur, and to Miquel's patient investigations, we know to-day by scientific means, not only the number of the micro-organisms which flit about in the air, but also the divers varieties of these microbes, which belong especially to the genera micrococcus, bacillus, and bacterium, but more particularly to the first of these genera.

Microbiologists have even gone further; they have commenced the study of these different schizophytes from a botanical point of view, as well as from a physiological; and there is one fact which we have learned from these studies, namely, that when the bacteria thus collected from the air have been cultivated in suitable media and inoculated in animals they have given rise to nothing but negative results, and it has not yet been possible to reproduce in animals contagious diseases by the introduction of these micro-organisms. But, as Miquel has justly remarked, these results should be accepted with the greatest reservation, and one may well ask if the procedures put in usage for the collection and cultivation of the schizophytes may not be sufficient to destroy their virulent properties.

As you might have foreseen, the greater part of these micro-organisms—that is to say, eighty per cent. —are aërobiotic—*i. e.*, they have need of oxygen to live and develop.

As for their number, I showed you in one of my late lectures that this varies according to the localities where they are collected, and that the purity of the air is in inverse proportion to the microbes it contains. While in high altitudes you find but very few microbes to each cubic metre of air, it is by the thousands that you meet with them in our hospital wards; and when you reflect that a man breathes through his lungs in twenty-four hours ten cubic metres of air, you can form an estimate of the prodigious number of micro-organisms which penetrate by this channel, which forms the most easy and rapid mode of entrance into the organism of infectious or medicinal principles. In fact, substances which penetrate by the lungs, are carried almost directly to the left ventricle, and thence are distributed through the entire organism, and this explains the interest which Claude Bernard took in the method of tracheal medicinal injections in cases of urgency.

I am well aware that, by a lucky anatomical conformation, man breathes only exceptionally by the mouth, and that the air penetrates chiefly by the nasal fossæ, which, by their anfractuosities, act the part of the filtering apparatus employed by Pasteur to purify the air, but this infiltration is often very incomplete, since it is by the pulmonary passages that the contagious and infectious diseases are chiefly transmitted.

I cannot here, in this purely medical lecture, discuss in its entirety the subject of antiseptic pulmonary medication, which, by its developments, constitutes one of the grandest chapters of modern hygiene, that of the aëration, ventilation, and disinfection of dwelling-houses.

I shall only refer in this connection to the divers experiments in which you took part on the occasion of the recent cholera epidemic, when Dr. Roux and myself, under the direction of M. Pasteur, showed that of all the antiseptic gases, the most effective is sulphurous acid, and this chiefly by reason of its power of penetration. We proved that in the proportion of twenty grams to each cubic metre of space, sulphur in undergoing combustion destroys the micro-organisms contained in a liquid, and that in the proportion of forty grams to each cubic metre it destroys the same micro-organisms in a state of desiccation. But in such media man cannot live, and what we want especially to find, is some safe disinfectant, whether liquid or gaseous, which will destroy the schizophytes, while permitting man to sojourn in the medium where this disinfection is practiced.

I know that researches in this direction are being earnestly pursued, and that hope has been entertained that we may find in ozone one of these parasiticide agents, but thus far experiments have not given results confirmed with all the scientific rigor which such researches demand. Others, going back to a notion already put in practice in the middle ages, have thought that the introduction of these micro-organisms into the economy might be avoided by the application of protective masks or respirators, such as are used in work-shops and factories where the air becomes impregnated with noxious dust; the breathing air being filtered through layers of cotton. I will not dwell longer on this point, desiring merely to hint at this side of antiseptic pulmonary medication. But there is another aspect of the question on which I desire to dwell longer, it is that which concerns the destruction of certain micro-organisms which are the efficient cause of pulmonary affections, and I wish in particular to say something about the action of antiseptic substances on the microbe of tuberculosis.

When at the end of 1882 Koch, in his remarkable communication, demonstrated the microbiotic nature of phthisis, he by this discovery revolutionized the history of tuberculosis, and gave a striking experimental confirmation of the theory advocated many years before by my learned colleague and friend Dr. Villemin.

When Villemin in 1865, in his brilliant work on tuberculosis, announced that this disease was virulent, contagious, and inoculable, he raised in the medical world a real tempest, which was not allayed at the time of Koch's researches, and many of the most eminent physicians disputed several of the terms of Villemin's definition. To-day all disputation has ceased before experimentation, and everybody is agreed that the bacillus tuberculosis is the real contagious agent of this disease.

But the application of Pasteur's views was destined not to be limited to tuberculosis; these views were soon to modify and revolutionize a disease which has been considered as a type of inflammatory diseases. On the 19th of November, 1883, Friedlander, completing the first researches which he had made in 1882, showed by decisive experiments that there exists a schizophyte proper to pneumonia, and a few days later, namely, November 30th, Talamon, at the Anatomical Society, made known the result of his researches, and showed that if he did not absolutely agree with Friedlander respecting the form of the bacillus observed, he none the less considered it as the causal agent in pneumonia.

These experimenters thus gave justification to the tentatives made in 1878 by Klebs, who, under the name of *monas pulmonale*, had described a microbe peculiar to pneumonia.

This discovery of a micro-organism as cause of certain pulmonary affections ought to be utilized by therapeutics, and just as in basing myself on new experimental researches, I endeavored to establish an antiseptic intestinal medication, so also I would venture to suggest the first principles of an antimicrobic pulmonary medication:

Let us see first what data experimentation can furnish us, and here I shall take as my basis the labors recently undertaken in France, and, in particular, the able researches of Hippolyte Martin, who has performed experiments of the greatest interest on tubercle and inoculation by tubercle.

Hippolyte Martin first established the fact that inoculation constitutes the best means of recognizing the real nature of tubercle. When, in fact, you inoculate in animals—guinea-pigs or hares—foreign bodies, or septic matters, you determine in these animals granulations more or less generalized in all the viscera, and which macroscopically and microscopically are identical with tubercles. But that which enables us to distinguish pseudo-tubercles from true tubercles, is that the former have no power to produce tuberculosis in other animals, while, on the contrary, true tubercle indefinitely reproduces the same disease in animals in which it is inoculated, so that even before the discovery of Koch's bacillus (as early as 1881), Hippolyte Martin had been able experimentally to demonstrate the proposition: *tubercle alone engenders tubercle.*

From these experiments, this capital fact is put in clear light, that when you would judge of the real value of antiseptic substances in the destruction of the bacillus of tuberculosis, it is not sufficient to practise one inoculation alone, which may cause the production of pseudo-tuberculous granulations, but the inoculations should be in series—*i. e.*, the product of one inoculation being inoculated in another animal, and so on, and all experimenters who have not taken care to avoid this source of error, must expect to see their results called in question.

Repeating the experiments of Arloing, of Cornevin, and of Thomas, who had made trials of the different antiseptic agents to antagonize the anthracoid bacteria, Hippolyte Martin, in his turn, experimented with these antiseptics against the bacillus tuberculosis. This was his procedure: He crushed and pressed portions of viscera studded with tubercles, and the juice which he squeezed out was put in contact with the fresh amniotic liquor of a sheep, and to the whole was added a given quantity of the medica-

* Hippolyte Martin, on transformation of true or infectious tubercle into an inert foreign body under the influence of high temperatures and various reagents. Arch. de Phys., 1881, p. 93; Revue de Méd., 1882, t. ii. p. 905, and 1883, t. iii. p. 209.

ment to be experimented with; in this way trials were made with salicylic acid, bromine, carbolic acid, creasote, quinine, and corrosive sublimate. These mixtures were injected into the peritoneum of guinea-pigs, and on the death of the animals the inoculations were continued in order to ascertain the real value of the granulations which were found at the autopsy.

In the case of salicylic acid, solutions of five per cent. were powerless to destroy tubercle. Bromine in solution, 1 per 10,000, and 1 per 1,000, all proved to be inefficacious; at 1:500 the action was more marked, but in this strength the solutions are caustic. In the case of phenic acid, solutions of 1:1000 had no effect, and even those of 3:100 or 6:100 had a doubtful action, although caustic effects were manifest. Creasote, so much vaunted in tuberculous affections, failed to destroy the bacillus of tuberculosis, even in the proportion of 1 per 1000; and it was the same with quinine. In fine, corrosive sublimate, which has justly been considered as one of the most powerful antiseptics, proved itself without action upon the micro-orgaism of tuberculosis even in the proportion of 1 per 1000.

What do all these experiments go to show? This surely, that the tuberculous element offers an extraordinary resistance to all antiseptic agents, and that, in order to destroy it, you must at the same time destroy the living tissues which are its habitat. In these experiments we must, in fact, carefully distinguish the antiseptic from the caustic action. When you destroy by a physical or chemical agent the elements of a tissue, you thereby abolish its virulent properties; this is, for example, what happens by heat. Hippolyte Martin, in fact, obtained destruction of the tubercle bacillus by heat, and true tubercle was transformed into an inert body when the temperature of 85° C. was exceeded, and this result was the more certainly attained by a temperature of 100° C. and above.

In a manuscript note, which Hippolyte Martin has kindly put into my hands, he signalizes the favorable effects of hydrofluoric acid, which in the proportion of 1 per 3,000 and, perhaps, of 1 per 4,000, appears to be destructive to the parasite of tubercle. But we must not, at the same time, forget the extreme causticity of this acid, which acts much more as a destroyer of tissue than as a veritable aseptic.

However, all the experimenters have not arrived at the same conclusions as Hippolyte Martin. Thus it is that Vallin, in the interesting communication made this year to the Academy of Medicine, has shown us that burning sulphur, in the proportion of one ounce to the cubic metre, destroys the virulent properties of tubercle juice. Corrosive sublimate, in the proportion of 1 per 1,000, has the same action, but in that of 1 per 2,000 it is inefficacious, while nitrosyle, in the proportion of 66 centigrams per cubic metre, also causes sterilization of tubercle juice. Vallin's procedure was a little different from that of Hippolyte

Martin; he made use of strips of filter paper soaked in distilled water; between these strips tuberculous products were crushed, then the paper was dried in the open air, and submitted to the action of divers disinfecting agents; they were finally soaked again in distilled water, and the liquid obtained by expression was injected into the peritoneum of guinea-pigs.

A physician of Allevard, Dr. Niepce, has lately affirmed that sulphuretted hydrogen destroys the bacillus of tuberculosis in the sputa of phthisical patients, and that the sputa thus acted upon become powerless to induce tuberculosis in animals.

A graduate of the school of Montpellier, Dr. Pilate, has repeated, with the aid of Drs. Cavalier and Mairet, the experiments of Niepce, and he affirms that of all the agents with which he has experimented, such as mercuric iodide, corrosive sublimate, helenine, thymol, iodine, carbolic acid, boric acid, the most active is sulphuretted hydrogen. Dr. Sormani and Brugnatelli claim to have obtained an antibacillary action with a certain number of liquids, and even in feeble doses. On the other hand, the experiments made in 1883 by Coze and Simon are absolutely confirmative of those of Hippolyte Martin. These experimenters have divided their researches into three groups. In a first series they mix forty centigrams of phthisical sputa, in which they had previously noted the presence of bacilli, with different antiseptic substances; then, after forty-eight hours' contact, they injected these mixtures in guinea-pigs in the region of the groin.

In a second series of experiments they injected only tnberculous matter; then they practised immediately afterward, and for several days in succession, antiseptic injections in the region of the first tuberculous inoculation.

Finally, in the third series of experiments, they endeavored to see if they could arrest the development of the disease in animals already the subjects of tuberculous evolution.

They thus, in their three series of experiments, made trials of bichloride of mercury, eucalyptol, sulphuretted hydrogen, creasote, helenine, thymol, etc. The last two series of researches gave nothing but negative results, and as for the first, creasote alone seemed to them to retard the local development of tuberculosis.

What conclusion shall we draw from all these experimental researches? Must we admit that in man the bacillus of tuberculosis resists all our therapeutic measures? Such a conclusion, gentlemen, would be altogether too premature. These experiments show us that in animals such as the guinea-pig and hare, which present a singularly favorable soil for the development of tuberculosis, our medicinal agents prove themselves impotent to destroy the bacillus. But this is not the case with animal species, which offer a better resistance to the bacillus—the dog, for instance—and here we see the bacillary inoculations often fail. It is the same with man, and before the discovery of Koch (as well as since) we were in possession of unimpeachable observations showing the cure of bacillary phthisis. So, while recognizing the useful indications furnished by experimental researches, we must, in order to appreciate their just value, turn to clinical observation.

The discovery of the bacillus, and the experiments which we have just mentioned, indicate to us the therapeutic paths which we are henceforth to pursue, and which comprehend two principal lines of investigation—the one, by which we are to endeavor through medicinal means to oppose the multiplication of bacilli, and the other, by which we seek by hygienic means so to modify the culture medium, that it shall be unfit for the habitat of the bacilli.

Prof. Germain Sée, in his work on *Bacillary Phthisis*, has insisted at great length on the new departure which ought to be taken by the therapeutics of tuberculosis since Koch's discovery, and what conditions should be fulfilled by the antivirulent agent, which he calls *necrophytic*.

In the first group of agents, we have chiefly medicinal inhalations, and medicaments which are eliminated by the lungs.

Among the medicinal inhalations, it is substances such as iodine, iodoform, eucalyptol, corrosive sublimate, phenic acid, etc.—in a word, the least irritant antiseptic agents—which should be recommended; and our late venerated master, Piorry, seemed to have had prevision of its parasiticide power, when, with such persistence, he insisted on the utility of iodine inhalations in tuberculosis. I believe, also, that iodoform, so much vaunted these late years, may be utilized in these inhalations, being not only a very active aseptic agent, but also a powerful sedative.

You know how these inhalations are practised. They consist in aspiring a current of air through medicinal solutions, and breathing the air thus medicated. A wash-bottle with two tubes communicating with the exterior (one tube dips beneath the liquid), answers the purpose. You can, if you prefer, use the inhaler of Le Fort, or Lille, in which the air penetrates to the liquid through holes in the sides. Le Fort puts into his bottle the following mixture: Camphor, 8 parts; tar, 4 parts; tincture of iodine, 4 parts; Hoffman's anodyne, 1 part. You may also employ some of the more complicated inhalers, in which the air is not aspirated by the patient, but projected upon him by a ventilator operating by clock-work, as in Haro's apparatus.* Haro uses iodoform principally, in the pulverization of which it is necessary that the

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*Haro: On a New Kind of Inhalations Practised at Amelie les Bains; Bull. de Thérap., t. cvi. p. 408.

Le Fort: On a New Inhaler, and its Action in Pulmonary Affections; Bull. de Thérap., t. ci. p. 343.

temperature of the mixture should be kept raised. You have seen me use in one of our wards an ingenious vaporizer devised by M. de Linières. This vaporizer, which is put in operation by a rotary movement, projects in the ward vapor of water charged with iodoform; but it will take us many months to estimate at their just value the effects of these vaporizations of iodoform upon our tuberculous patients. And now, while on this subject of antiseptic inhalations, I ought to speak to you of the experiments being performed at the present time by my pupil, Dr. Chevy, with hydrofluoric acid, experiments which have been made the subject of his inaugural thesis.

Struck by the results indicated by Hippolyte Martin, demonstrating the remarkable antibacillary action of hydrofluoric acid in tuberculosis, it occurred to me to employ this acid in inhalations; Dr. Bergeron had pointed out the extraordinary effects which he had obtained from the vapors of this acid in the treatment of diphtheria, while Chevy and myself were showing that animals might live without inconvenience in an atmosphere containing 1 part of hydrofluoric acid to 1,155 parts of air.

Moreover, a careful investigation made in the great establishments where hydrofluoric acid is used for etching on glass, enabled us to determine, not only that an atmosphere thus charged with hydrofluoric vapors is not injurious to the workmen, but that, on the contrary, individuals suffering from chest affections had experienced favorable effects therefrom; on this point the overseers of the works are unanimous.

We have since then been experimenting by placing our patients in a special ward, of a capacity of about twenty-two cubic metres, in which department we vaporized one grain of pure hydrofluoric acid (which would give the proportion of about 1 part to 25,000); the liberation of the hydrofluoric acid is obtained by placing the liquid in a small leaden cup heated in a sand-bath. Our tuberculous patients remain an hour in this atmosphere. I can say nothing as yet of the results which this experimentation may give; before formulating any positive conclusions these trials must be continued for months and even years.

What I can, however, affirm, is that in the immense majority of cases these inhalations of hydrofluoric acid have not been at all inconvenient to our patients. Some of them have experienced a little irritation in the throat, due to the local action of the acid, but the majority have derived a certain benefit in the way of diminution of the cough and expectoration. I am inclined to think that these inhalations in their application to the treatment of tuberculosis constitute a remedy of much promise.

But permit me, since I am now on the subject of hydrofluoric acid, to say, that of all the antiseptics known, this is, perhaps, the most powerful, and in the experiments which Chevy and I undertook, it required but infinitesimal quantities to arrest fermentation. Pardon, gentlemen, this long digression, but the most of you have followed with interest the experiments to which I have alluded, and I thought it worth the while to sum them up on this occasion. I come back again to my subject, and mention among the means to employ in the treatment of phthisis, antiseptic sprays.

In my opinion these latter are very much inferior to the inhalations, for it is only exceptionally that these pulverizations penetrate to the interior of the lungs. Dr. Miquel, however, claims to have obtained good results in tuberculosis from pulverizations of the following mixture: biniodid of mercury, 1 part; laudanum, 20 parts; distilled water, 2,000 parts.

In order to obtain a more immediate action, it has been advised to inject the antivirulent solutions directly into the pulmonary parenchyma. The practice has been attempted in Germany by Heller, who has thus made, in three patients affected with phthisis, intra-parenchymatous injections of corrosive sublimate in solution.

In France, Prof. Lepine and his pupil, Truc, have repeated these experiments. This is their manner of procedure: they employ alcohol at 90° containing a variable proportion of creasote, 2 to 4 per cent.;

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*Chevy: Thèse de Paris, 1885, and Bull. de Thérap., April 15, 1885.

they use for these injections the syringe of Pravaz with the No. 1 needle of Dieulafoy's aspirator, and have already performed twenty-five injections on fifteen patients, introducing each time into the parenchyma of the lungs a quantity of the creasote solution varying from a few drops to fifteen or twenty cubic centimetres.

The results thus far have been uncertain, and in patients affected with advanced lesions they have observed hardly any symptoms of amelioration. Therefore, Lepine and Truc speak very reservedly respecting the definite curative value of these parenchymatous injections, and, for my part, I think that these injections are liable to be more dangerous than useful.

Internally, it is still to such medicaments as creasote, the turpentines, the sulphur preparations, that you will resort; these may render service by their elimination by the pulmonary passages. But whatever parasiticide action these agents may be supposed to possess, they must still yield the palm to the modifiers of nutrition, which render the organic soil unfit for the microbes.

Until by a more exact acquaintance with the bacillus and the conditions of its culture and development, we shall be able, as in the case of anthrax and rabies, to prepare an attenuated virus which, by its inoculation in man, shall preserve him from being the prey to these bacilli, we must direct all our efforts to create in individuals predisposed to tuberculosis a soil unfavorable for the culture of the bacillus. To obtain this result we must utilize two factors: air and alimentation.

Although we have not very precise data respecting the action of the air under different degrees of pressure on the microörganism of tuberculosis, and researches are needed before we can come to any definite conclusion on this point, we have very good evidence that high altitudes are unfavorable to these bacilli, and even destroy them. The law established by Jourdanet, that at certain altitudes phthisis does not exist, finds a certain confirmation in this fact, that the higher you go, the fewer the microbes you find in the air.

As for alimentation, the method first brought into vogue by Debove has proved to be of the highest utility, and it is to-day generally admitted that, in certain cases where the integrity of the digestive tube is complete, one may, by super-alimentation, obtain amelioration and even cure in pulmonary consumption. The important communication of Broca and Wins* has given us many conclusive observations to this effect, and my pupil, Dr. Pennel, published in 1882 a series of cases where the beneficial action of forced feeding was most manifest,† and I am astonished that

*Broca and Wins: Bull. de Thér., 1883, t. cv., p, 289.

†Pennel: Alimentation in Phthisis, Bull de Thér., t. cii. p. 85.

the homœopathic physicians who often give such scrupulously nice attention to the details of their hygienic treatment, have rejected, as Jousset has done, the employment of super-alimentation, by powders of meat, for a vegetarian regimen.

I cannot here enter into the details of this super-alimentation; you know that, by reason of recent improvements in the manufacture of meat powder, we can now give the latter in chocolate and in syrups, a consequence of which is that we do not now employ "gavage" in pulmonary complaints, reserving it exclusively for patients affected with dilatation of the stomach or persistent vomiting of food. Here, too, I have abandoned the stomach tube which I formerly used, and which goes by the name of "*gaveuse*," for the tube of Debove, which, owing to its resistence and small volume, is introduced without the least difficulty.

What I can affirm, is that in tuberculous patients that have profound and obstinate anorexia, or that vomit their food under the influence of the least effort of coughing, gavage will sometimes give you exceptionally good results. Under its influence the appetite returns, the strength improves, and what is a singular fact, and one not well explained, is that while all food introduced by the mouth is vomited, the alimentary mixtures introduced directly into the stomach by the syphon are well supported. I assign then a preponderant rôle to superalimentation in the antiseptic treatment of tuberculosis and this, because it constitutes, in my opinion, our most powerful means of modifying the culture soil.

As you see now, if Koch's discovery has not already revolutionized the therapeutics of pulmonary phthisis, it has nevertheless enabled us to give a scientific explanation of the modus operandi of the greater part of the medicinal agents which we use, and for this very reason it constitutes a step in progress, both from a therapeutic and a prophylactic point of view. This great fact of the contagiousness of tuberculosis is to-day admitted without dispute, and we see on all sides hygienists as well as physicians endeavor to establish on a scientific basis the hygiene of the tuberculous. When you reflect, gentlemen, that at this very time (December, 1885) scarcely three years have elapsed since the discovery of the microbe of tuberculosis, and when you consider the large number of scientific researches and the already voluminous literature to which it has given rise, you cannot fail to entertain with me the hope that the day will come when, better enlightened as to the life history and mode of development of the bacillus, we shall be able to destroy it in the living organism, or at least attenuate its effects.

CHAPTER IX.

ON ANTISEPTIC PLEURAL MEDICATION.

GENTLEMEN: In the last chapter I stated the basis on which henceforth antiseptic pulmonary medication should be founded, and in that connection I insisted particularly on the importance of the antimicrobic treatment of tuberculosis; to-day, in order to complete the subject, I wish to say a few words about the application of the antiseptic method to pleural affections; this will be the subject of this short lecture.

Two quite modern methods of a surgical order have profoundly modified the treatment of pleural affections, viz: aspiration and pleurotomy.

Since Dieulafoy, by his invention, rendered easy for us the method of aspiration, one of the first applications of this method was addressed to pleuritic effusions, and for the first few years it was the custom to puncture and aspirate in all cases of pleuritic exudation, small as well as large. Physicians were heard to maintain, as did my regretted master, Behier, that we ought by an early aspiration to withdraw the liquid from the chest as soon as the physical signs enable us to recognize the least effusion.

This enthusiasm of the onset was not allayed till Ernest Besnier showed us, by figures that could not be gainsaid, that the mortality of pleurisy since the practice of aspiration was introduced, instead of being lessened, was increased. While recognizing that in this increase of mortality there is doubtless another factor, namely, a greater intensity of the disease, good clinical observers nevertheless regard it as probable that the abuse of aspiration punctures may have had a share in this result. Those who adopted this view based themselves principally on the ideas which to-day dominate surgery; I allude to the possibility of the penetration of certain micro-organisms by the punctures. So, in order to render this little operation free from all danger, it was proposed to perform it according to the strictest rules of antiseptic surgery, and hence we have seen Débove subject the trocars and needles of the Potain aspirator to a heat of above 100° C. before using them.

The complication of this latter manœuvre has rendered aspiration somewhat more difficult, but, whether this preliminary measure be carried out or not, it is the rule to-day to wash all parts of the Potain aspirator with strong solutions of phenic acid, and to carefully fire the trocar by dipping it in alcohol and setting fire to the alcohol; finally, to use carbolated vaseline to grease the instrument with.

But the antiseptic method has been especially applied to pleurotomy, and it must be conceded that it has in many points modified this operation. But, before describing these modifications, I wish to say a few words about a little harmless measure which will enable you to recognize the reality and the nature (a pleural exudation; I refer to the employment of yo hypodermic syringe.

When you are in doubt as to the presence of a effusion or its nature, it will be sufficient to make wit your syringe a puncture into the pleural cavit through an intercostal space, and then draw up syringeful of liquid—provided there be any liqui there. This aspiration will give you useful inform tion, and it can cause the patient little pain and ca do him no harm whatever.

Since Moutard Martin taught us the rules (pleurotomy, this operation has been one of ordinar practice, and I have already shown in the second vo ume of my Clinical Therapeutics the marvellous re sults which may be obtained from it, citing the statis tics of the surgeon who, out of 70 cases of puruler non-tuberculous pleurisy, obtained 57 cures. Bear i mind that with reference to these purulent tuberculou or non-tuberculous pleurisies, we have to-day a sur means of verifying our diagnosis, and thereby estab lishing a sure prognosis. I refer to the finding c not finding of tubercle bacilli in the purulent effu sion.

I cannot, in this chapter, trace anew all the step of the operation, for the details of which I shall hav to refer you to the work above mentioned. I sha here only point out the modifications which have re cently been made in the operation, to the sum (

which has been given the name of antiseptic pleurotomy.

But whether it be antiseptic pleurotomy or pleurotomy as it was formerly practised, with which we have to do, it is a certainty that the operation can be performed to-day almost without pain. You know that in consequence of our not being able to chloroform patients on whom pleurotomy is performed, we have been advised to employ local anæsthesia in the form of ether spray, but this way of obtaining anæsthesia has the disadvantage of determining severe pain when reaction sets in, and of provoking hæmorrhages, which are sometimes profuse and quite difficult to arrest.

To-day we are in possession of a means which enables us to complete all the steps of the operation without pain. It is, as you will readily guess, hydrochlorate of cocaine. I have just applied this method, and with perfect success, on two of my patients on whom I have operated for empyema. This is my mode of process: I have at hand a two-per-cent cocaine solution; I trace out with a pencil a line which I am to incise, and I introduce the needle of my hypodermic syringe successively at both extremities of this line, and throw into the cellular tissue two injections, and I take care, by pressure with my finger, to spread the liquid as thoroughly as possible over the region which my bistoury is about to traverse. I wait five or six minutes, and proceed to the incision of the tissues.

The cutting is absolutely painless, and it is not til you have reached the deep parts of the inter-costa space that any pain whatever is felt, and this is slight

You will then be likely, henceforth, to resort t(this simple expedient under such circumstances; and since I am on the subject of subcutaneous injections permit me to say that you can, by the same means allay the fits of coughing, so painful and so fatiguing which the patient experiences when you have giver exit to an effusion, but this time it must be morphine not cocaine, which you inject. It is a good plan tc have this injection ready, and inject it as soon as the pleura is incised, and the patient begins to cough.

I come now to the more important part of this lecture, namely, antiseptic pleurotomy.

Empyema, whatever may be the mode of treat· ment employed, can end in cicatrization and restora· tion *ad integrum* only by the juxtaposition of the two contiguous layers of the pleura, and this juxta· position can be effected only by the lung being main· tained in contact with the costal parietes which re· main fixed, or by the continued application to the pulmonary pleural surface, the lungs being more or less confined to the vertebral column—of the supple and elastic costal wall. From this first fact two im· portant prognostic conclusions result: first, the more movable the costal wall, and the more recent the false membranes, the greater the chances of cure. In ac· cordance with this first conclusion we explain the almost constant recovery of young children from purulent pleurisy, and the increasing rarity of recovery as the patient advances in years.

Estlander, by a bold and ingenious process, has proposed to remedy in aged patients the evil alluded to by resection of the ribs, and thus opposing a mobile wall to the pleural abscess. In France Bouilly, Perier and Berger have resorted to this operation with more or less of success. I say more or less, because in the two cases which I was enabled to observe, there was a considerable amelioration, but the patients remained ever afterwards subjects of a pleural fistula.

Nevertheless, by the side of these partial successes, it is but fair that we should mention the brilliant results which this operation has had on one of our most talented and brilliant surgeons, who to-day owes to it his complete restoration.

The second conclusion pertains especially to the lungs, and we ought whenever possible to open the pleural abscess before the organization of false membranes has fixed the lung to the vertebral column by firm and resistant bands. Therefore all physicians and surgeons who have counselled antiseptic pleurotomy have insisted that it should be done early—that is to say, as soon as the presence of a purulent effusion has been satisfactorily determined. This is a condition essential to the success of the operation, as in these cases you can obtain, so to speak, reunion of the costal and pulmonary pleuræ by first intention.

It is essential then in order that the operation may give the results which we have a right to expect from it, that is to say complete and permanent cure of the empyema in a space of time varying from three to five weeks, that we have young subjects to deal with whose thoracic walls are supple and elastic, or at least that we have to do with empyema at its onset. When, on the contrary, you open the pleural abscess at a very late period, or when your subjects are aged people whose costal cartilages are ossified, the antiseptic method is no longer applicable, and you ought to resort to the ancient mode of operating; and even then there will always be reason to fear that the patient will carry a discharging pleural fistula the rest of his life.

The rules of antiseptic pleurotomy have been well laid down in France by Débove, Lucas Championniere, and especially by my former pupil and present colleague, Dr. Moizard, who is one of the most earnest advocates of this form of pleurotomy. You will find, moreover, in a work published by Hache, and in the theses of M'lle Kraft, Guinart and Le Couédic, all the material needful for the study of this question.*

*Moizard, De la pleurotomie septique et antiseptique (Revue des maladies des enfants, 1884). Mlle Kraft, Traitement de l'empyème par la pleurotomie antiseptique (Thèse de Paris, 1884, p. 153). Guinard, Du meilleur mode de traitment de la pleurésie purulente (Thèse de Paris, 1884). Le Couédic, De la pleurotomie antiseptique (Thèse de Paris, 1885).

These rules consist in performing the dressings according to the most minute requirements of antiseptic surgery; the operation should be done in a Listerian atmosphere, all the sponges and drainage tubes must be soaked in a strong solution of carbolic acid; and when once the operation is terminated, Lister's dressing should be employed in its entirety, that is to say, protective, phenicated gauze, mackintosh, salicylated wadding, etc. As a free and complete flow of pus is desired, it is the rule in these cases to make the incision as low down as possible, that is to say just above the upper border of the seventh rib. The incision is made as in the ordinary operation, layer by layer, and care is always taken to follow the upper border of the rib below. When once the pleura is opened, the operator introduces his finger into the pleural cavity, and with his finger as his guide, he enlarges the opening into the pleura with his probe-pointed bistoury.

When once the pus is evacuated, you wash out the pleural cavity with a saturated solution of boracic acid, continuing the irrigation till the liquid returns perfectly clean from the chest. Some surgeons recommend that the first lavage be followed by a second made with a solution of chloride of zinc or corrosive sublimate; I do not see much advantage in this second washing, and I never resort to it. But among the antiseptic solutions which are put into usage, there is one which you ought absolutely to discard, I allude to carbolic acid; you have had opportunities to see in my hospital service the disastrous results produced by these carbolized lavages of the pleurà, which have produced a veritable poisoning, with refrigeration, and grave symptoms which have hastened the end of the patient.

You then place in communication with the purulent cavity a drainage tube, which you have care to fasten by a string or tape, passed around the waist. *A propos* of these drainage tubes, you know that I employ a flute-like arrangement, constructed by Galante, called the *flute of Pan*, which consists of a series of drainage tubes cut at different lengths, and kept in position by a disk which closes the opening into the chest.

This flute of Pan, applicable to the ordinary cases of pleurotomy, is not adapted for antiseptic pleurotomy, and you will have to be content with a large drainage tube, or it may be a series of drainage tubes, which you leave in the opening you have just made, but which you must have care to fix firmly by passing through them a stout thread, which is made fast to the chest: the necessity of this is apparent from the fact that a certain number of cases are on record where these drainage tubes, owing to the efforts of respiration and the movements of the patient, have fallen into the pleural cavity.

You then apply over the whole a complete Lister dressing, which you cover with a certain quantity of wadding; then (and this is the capital point) you disturb the dressings but rarely, and, what is essential, you refrain from further washing out the pleural cavity. It is not till three or four days after, and according as the patient is more or less inconvenienced by the liquid which flows from the chest (unless, indeed, the pus earlier takes on a putrid odor) that you remove the old dressing and put on a new one, which in its turn is designed to be left on for three or four days. It is understood that each of these dressings should be made in a carbolized atmosphere, and with all the precautions of the antiseptic method. At each dressing you remove the tube, and you take care to shorten the drainage tube as fast as the cavity contracts.

In following these rules, if you have a patient who fulfills the conditions which I have enumerated above, you may expect to obtain a definite cure, and without fistula, in a space of time which varies from three to five weeks. If you will take the trouble to refer to the statistics, those, for instance, furnished by M'lle Kraft, you will see that out of 19 cases of pleurotomy in the adult, in 12, where the pleurotomy was followed by repeated lavages, there were two deaths, while in the seven cases treated by only one lavage, there were seven recoveries. Hence this lady claims that the operation for empyema by early pleurotomy, rendered completely antiseptic and followed by only one lavage, is an operation of so little gravity that one may resort to it with almost absolute certainty of cure.

I fear that this is a complete over-statement of the case; the one lavage which plays the most important part in antiseptic pleurotomy, entails a result which does not at all depend on the method employed, but rather on circumstances inherent in the patient himself, and whenever the pus becomes fetid, all the advocates of this method recommend to return to repeated washings of the pleural cavity with antiseptic liquids as we were formerly in the habit of doing.

While recognizing that antiseptic pleurotomy ought always to be applied at the onset of empyema, in order that cicatricial union may be obtained of the pus cavity, which is an immense advantage, it must be admitted that in a great many cases this union is impossible, and that the best we can do is repeatedly to wash out the pleural cavity. Such are the points to which I desire to call your attention concerning antiseptic pleural medication.

CHAPTER X.

ON ANTITHERMIC MEDICAMENTS.

Gentlemen:—I intend to-day to begin the study of antithermic medication, and shall devote to it the three following lectures. In the first I shall consider the antithermic medicaments which have been in vogue down to the last few years. In the second, I shall take up the study of resorcin, antipyrine, kairine, and thallin. In a third and final lecture, I shall examine the indications and contra-indications for the antithermic medication.

Since the year 1834, when Runge first extracted phenic acid from coal tar, chemists have obtained by analyzing the residual products of the fabrication of coal gas derivatives of a constantly increasing importance, so that we may now say that this illuminating gas, which was formerly considered as the most important element in the destructive distillation of coal, is now regarded from an industrial point of view as only a secondary product. The coloring matters, aniline and its derivations, the phenols and oxyphenols constitute, in fact, to-day one of the most important branches of the chemical arts.

Medicine has largely profited from this group of bodies, early finding there medicaments that are powerfully antiseptic. Then, when clinicians ventured to make trial of these medicaments internally, it was observed that all, or almost all, have the curious property of depressing the temperature in a very marked manner, and this has enabled us to construct a new class of remedial agents, the antithermic medicaments.

But in order that you may well grasp the intimate action of these various medicaments, it seems necessary for me to sum up in a few words the various hypotheses that have been made respecting fever and hyperthermia in general.

Fever, as you know, is essentially characterized by two cardinal symptoms: augmentation of the pulse, and augmentation of the heat. Since the introduction of the thermometer into the study of diseases, the second of these symptoms has become of increasing importance, and to-day we relegate the study of the pulse to an absolutely secondary rank. It is, then, this hyperthermia which constitutes the characteristic, dominant fact of fever, and from this it borrows its name (*febris*, from *fervere, to glow with heat, to boil*).

Many theories have been put forth to explain this febrile hyperthermia, and when you take a general view of them, you see that they can all be grouped in two great classes; in the one physiologists have hypothecated an augmentation of the combustions of the economy; in the other, on the contrary, this augmentation of combustions is not admitted. To-day, despite the recent experiments of

Charcot, and those more recent still of Maurel, everybody is agreed in admitting that there is this increase of combustions, and if there be any contradiction in the results obtained on this point by different physiologists, it is because the latter did not place themselves in the same conditions of experimentation.

You know, gentlemen, the most expeditious and clinical means for determining the activity of combustions taking place in the economy. I refer to the quantitative analysis of the urea. In order that you may appreciate by this process the increase of combustions in febricitants, you must compare the quantity of urea excreted in twenty-four hours by a fever patient, not with that excreted by a man who is on full diet, but with that eliminated by a person fasting, since febricitants take little or no food. When this kind of comparison is made, it is seen that there is always augmentation of urea production in fever.

Moreover, the experiments of Liebermeister show that there is also augmentation in the carbonic acid exhaled. Lastly, the application of calorimetry proves in a sure manner that the febricitant evolves more heat than the healthy man, and that the production of heat is in direct relation with an augmentation in the chemical combustions in the organism. Therefore the theories of Traube and Hunter, who teach that febrile hyperthermia is due solely to modifications in the capillary circulation, ought to-day to be abandoned.

But to say that fever is due to augmentation of the combustions of the economy, is not to solve the problem, but simply to remove it farther back; hence, physiologists have tried to penetrate more deeply into the matter. ·First of all, Liebermeister has shown us that in fever there is modification in the regulation of heat. What is this organic power of heat regulation? It is this: we can by artificial means augment the temperature of the organism, but as soon as these means cease to act, the bodily temperature always comes back to the normal, *i. e.* to 37° C. Hence, then, man in the physiological state tends always to maintain his temperature about a uniform standard, while in fever the bodily heat is regulated by an abnormal standard.

This study of the relation of the temperature in fever is important, but it does not absolutely resolve the difficulty, and we ought to know how this abnormal regulation comes about. Here two great causes have been invoked: Some would place in the nervous system the starting point of this trouble; others have located it in the blood; in other words, we have the nervous theory of fever, and the humoral theory.

Basing himself on his remarkable experiment of the section of the great sympathetic in the hare, an experiment which, as you know, leads to a very marked augmentation of temperature in the ear on the side where the nerve was cut, Claude Bernard inferred that the great sympathetic is the moderator of the chemical combustions of the economy, and fever was, in his estimation, but one of the manifestations of paralysis of this portion of the nervous system. Tsheschichin in acting on the pons varolii of hares, determined augmentation of the temperature of the body, and hence located in the mesocephalon the heat centre of the economy. Vulpian does not acknowledge as the special seat of calorification either the great sympathetic or the mesocephalon, but he thinks that every modification effected in the nervous system, whether by direct or indirect causes, may have for its consequence to influence the combustions of the economy and thereby produce fever. So much for the nervous theories of fever. As to the humoral theories, every one is agreed in admitting the prominent part belonging to the blood in the febrile process. But some affirm that the blood-disorder is primary, others that it is only secondary. The study of new antithermic medicaments has not enabled us definitely to decide this question. On the contrary, you will see that if there are medicaments which depress the temperature by acting on the nervous system, there are still others which produce the same effect by profoundly modifying the blood globules.

Taken in their aggregate, the antithermic medications may be divided into two groups. In one the temperature is lowered by abstracting, through physical means, the heat which is generated by the phenomena of combustion taking place in the economy; in the other, it is by acting directly on the blood or on the nervous system that this heat-fall is produced.

The first group is typically represented by the cold bath treatment of pyrexia. You will allow me to be brief on this head; this question has been recently discussed at length before the Academy in connection with the treatment of typhoid fever by the method of Brandt, a discussion in which I took an active part; and I have, moreover, stated in the third volume of my Clinical Therapeutics * what I think of this method. Events which have since taken place have in no way shaken my conviction, and I persist in believing that the employment of the cold bath as an antithermic, and in particular in the treatment of typhoid fever, is destined to be virtually abandoned. Moreover, to abstract heat from the economy by physical means does not in any way oppose heat production.

I come now to the second group of antithermic medications, and what I have to say to-day will pertain to certain members of this group. These medicaments are subdivided into two classes; those which act directly on the blood, and those which act on the nervous system.

Among the medications which directly influence the blood, must first be mentioned blood-letting. If formerly the medical profession urged and applied with so much rigor the antiphlogistic method, it is be-

* Ed. of G. S. Davis. Part III.

cause it produced in inflammatory diseases and in pyrexia the following double effect: It raised the pulse and lowered the temperature; in a word, it combated one of the most perceptible manifestations of inflammatory diseases—the fever.

Consider what takes place in the couse of typhoid fever when there ensues an intestinal hæmorrhage of medium intensity: The temperature falls almost immediately, and on the fever chart you see this hæmorrhage marked by a notable depression of the temperature, which is continued on the following days; a depression absolutely like that produced by the administration of an antithermic medicament, such as sulphate of quinine, salicylic acid, antipyrine, etc.

I pass now to the study of the internal medicaments capable of lowering the temperature, but before giving a more complete account of those later antithermics, kairin, thallin, resorcin, antipyrine, and of those which preceded them in the order of their discovery, such as phenic and salicylic acids, I ought to say a few words about two medicaments long employed in fevers and phlegmasias; I refer to tartar emetic and quinine.

Tartar emetic is a powerful antiphlogistic, and, like blood-letting, it depresses considerably the temperature, determining an aggregate of symptoms very similar, from a thermic point of view, to what we see manifested in the third stage of cholera, whence the name of *stibian cholera*, which has been given to this symptomatic aggregate. Such a depression was not to be obtained without danger, and numerous were the observations during this time of furor for the administration of tartar emetic, where irremediable disorders on the part of the digestive tube were noticed. To-day the antiphlogistic medication by tartar emetic is pretty well abandoned, and you will see as I go on, that we possess means much more energetic and much less dangerous for bringing down the temperature.

If quinine remains still the medicine par excellence for morbid intermittency, and for fever and ague, it has shown itself inferior as an antithermic to the medicaments of which I am about to speak. To obtain appreciable antithermic effects in pyrexias, one is obliged to give large doses of quinine; and, as Broqua of Mirande remarked in 1840, and still later, Boucher of Villijosy and Monneret, when you wish, in typhoid fever, for instance, to bring down the temperature by sulphate of quinine, it is by grammes or scruples rather than by grains that you must administer it. These massive doses of quinine are not without danger; besides the encephalic disorders which they produce, there are sometimes engendered under their influence, as Laborde has shown, grave cardiac lesions characterized by a veritable myocarditis, such as is often developed in typhoid fever and other infectious and virulent diseases, as has been noticed by Huchard, Desnoy, and Hayem.

How does quinine act in depressing the temperature? Two hypotheses have been invoked. According to the one, the cinchona alkaloids have an antiseptic action, and in this way they oppose fever which is essentially a fermentation; it is, moreover, worthy of note, that a great number of antithermic substances are antagonistic of fermentation. What I say of quinine I may say also of phenic acid, salicylic acid, resorcin, etc.

The other hypothesis, much the more probable, is that the salts of quinine depress the temperature by acting directly on the thermogenetic centres of the cerebro-spinal axis. The effects of quinine on the nervous system are not at all doubtful, and the buzzings in the ears, the attacks of vertigo, and the cardiac disturbances sufficiently indicate that the cerebrum, and especially the upper parts of the cord where the heat centres have been located, are impressed by the salts of quinine.

I ought not to omit digitalis, which not only diminishes the number of the pulsations, but has a manifest action on the temperature. Hirtz and his followers have long insisted on the antithermic or rather on the antipyretic value of digitalis which they have administered in the pyrexias, and especially in typhoid fever. This method of treatment which Wunderlich advised as early as 1862, and which Hirtz tried in France in 1869, consisted in giving to typhoid fever patients hourly doses of a tablespoonful of an infusion of 12 to 15 grains of digitalis leaves in a gill of water. Save in the case of the followers of Hirtz who have continued this treatment, it seems to have been almost completely abandoned, and I believe that this abandonment is justified, for the reason that digitalis is a dangerous antithermic medicament by reason of its emeto-cathartic action, and its liability to paralyze the heart in the large doses required in order to bring down the febrile heat.

In fact, in the dose of 15 grains a day digitalis may produce toxic effects, and bring about a veritable asystolia, and this is the more likely to ensue from the fact that in typhoid fever, as in other infectious diseases, the heart, as we have just seen, is softened in its muscular texture.

It is on account of this same debilitating action on the heart that we should discard from the antithermic medication aconitia and veratria; these medicaments indeed depress the temperature, but in order to obtain this effect we have to evoke the toxic action of these alkaloids, and this is likely to be attended with dangerous results. It is not so with the medicament which I am next to mention, salicylic acid, which belongs to the aromatic series from which are derived all the antipyretics whose uses I am about to set forth.

Salicylic acid was the first medicament of this series to be applied to the treatment of pyrexias. The first experiments with this acid were made in

1874, by Bass, and one year later (1875) Reiss prescribed it in typhoid fever. This was a partial return to the first uses made of salicine, which was discovered in 1827 by Leroux, of Vitry-le-Francois, and which was for a time administered in fever and ague. The year following (in 1876) Stricker made trials of salicylic acid in acute rheumatism, and founded the principles of the salicylic medication, which gives every day such remarkable results in this painful affection.

Salicylic acid is an antithermic, and till the discovery of antipyrine, it was the most active and the least dangerous medicine of the kind. To bring down the temperature with salicylic acid, pretty large doses are requisite of this acid or of salicylate of soda, and from an antithermic point of view the first is far preferable to the second.

You must, as I said before, administer 1, 2, 3, 4, and even as much as 7 grammes a day in powders of one-half gramme every hour. This is Vulpian's and Hallopeau's way of giving it, who are very earnest advocates of the salicylic medication in typhoid fever.

The physiological effects of salicylic acid are very similar to those of sulphate of quinine, and it is probable that it is by acting on the thermogenetic nervous centres that salicylic acid brings down the temperature. But the same evils which we have ascribed to quinine when given for antipyretic effect apply to salicylic acid. The cerebral disturbances which the latter occasions are quite as annoying and as harmful as those of quinine, and despite the power which salicylic acid possesses as an antithermic, I am persuaded that if it occupies the first rank in the therapeutics of acute rheumatism, it deserves but a secondary place in the treatment of febrile hyperthermia; as for its action in intermittent fevers, this is well nigh nil.

Phenic acid was employed in fever before salicylic acid, but it was not till after the year 1880 (that is to say, since the labors of Desplats of Lille,) that any real scientific trials were made with this acid in fevers, and in typhoid fever especially. Skinner in 1873 did indeed advise phenic acid in the treatment of fever; Pecholier in 1874, and Tempeste in 1877, had also administered it in fevers; but all in such feeble doses that it is hardly probable that it was for an antipyretic effect that it was exhibited.

Phenic acid is a very powerful antithermic, and we have seen relatively small doses of thirty grains produce a fall of several degrees. These falls of temperature are accompanied by grave symptoms; the skin is covered with sweat, the respiration is oppressed, there is a general depression of the forces of the economy, all of which symptoms render phenic acid a dangerous medicament, for it owes its antithermic effects to its action on the nervous system and on the blood globules. It is, in fact, by diminishing the respiratory power of the blood, that phenic acid depresses the temperature, and we ought to banish from therapeutics these sanguineous antithermics which notably augment the blood alterations which characterize all the infectious pyrexias. Hence it is that phenic acid as an antithermic is to-day abandoned, and for this reason that we have found antithermics just as powerful which are attended with far less danger. This is a matter which I hope to show you in the next lecture, which will be devoted to the new antithermic medicaments.

CHAPTER XI.

ON NEW ANTITHERMIC MEDICAMENTS.

Gentlemen:—In my last lecture I spoke of the antithermic properties of quinine, phenic acid, and salicylic acid. To-day I shall conclude the subject by a brief consideration of resorcin, kairin, antipyrine, and thallin.

Resorcin, which two Viennese chemists, Hlassiwetz and Barth, discovered several years ago among the products of fusion got by treating galbanum with potash, has been since then obtained by Koerner by way of synthesis, and to-day makes a part of the group of phenols. It presents itself when pure under the aspect of beautiful silk white needles, very soluble in water, and gives rise, like salicylic acid, to a remarkable violet coloration in presence of perchloride of iron. In contact with sulphuric acid and phthallic acid it gives origin to *fluorescine*, of which several drops suffice to render water singularly fluorescent. From this combination with phthallic and sulphuric acids results a variety of beautiful colors, which cause resorcin to occupy an important place in the fabrication of coloring matters. This substance is eminently antagonistic to putridity and fermentation. Since 1877, Dr. Andeer, who has studied the question of resorcin under all its phases, has made known the numerous applications which may be made of this body in therapeutics, and I myself, in 1880, was the first to make trial of this medicament in France, and you will find in the thesis of my pupil, Dr. Callias, the results of our researches.*

The analogy which exists between resorcin and phenic acid led to the use of the former in fevers, and especially in typhoid fever.

In Germany there has been much said in praise of resorcin as an antithermic. Lichthein affirms that when administered in a massive dose of 30 to 60 grains it causes a very marked fall of temperature in typhoid fever. The observations which I have made have not given me results so advantageous, and neither in articular rheumatism nor in typhoid fever have I ob-

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* Hippocrate Callias, De la résorcine et de son emploi en therapeutique (Thèse de Paris, 1880). Dujardin-Beaumetz, Bulletin de thérapeutique (June and July, 1881). Revue de Hayem, 15 Jan., 1881, No. 62. Ramonet, Traitement de la fièvre typhoïde par l'acide phénique (Archives de médecine de April, 1882). J. Andeer, Eilenten Studien uber das Resorcin zur Einführung desselben in die praktische medicin, Wurtzburg (A. Stuber's Buch et Kunstahlung, 1880). Lichthein, Blätter für Scheweiger Artzte (Correspondanz, No. 14, 1880, Tribune méd., Nos. 628 et 630, 1880). Dr. W. Murrel (of London), A Case of Poisoning by Resorcin (Medical Times and Gazette, 22 October, 1881, p. 486). Dubois-Raymond, Archives de 1879. Supplément B. D. S., 61; L. Brieger zur Kenntniss des physiologischen, Verhaltens des Brenzcatechin, Hydrochinon und Resorcin und ihrer Entstehung im Tierkœrper.

served any considerable fall in the temperature. It is true that I gave the resorcin in fractional doses of 8 grains without ever exceeding the total quantity of half a drachm a day.

My colleague Desnos has repeated at the Charity these experiments to ascertain the antithermic powers of resorcin, and the results at which he has arrived, and which you will find recorded in the thesis of Dr. Peradon, confirm in part the conclusions which I had formulated. He has in fact remarked that resorcin has almost no action when administered internally in acute rheumatism, but in typhoid fever, when it is given in massive doses of from half a drachm to a drachm repeated two or three times a day, so that from a drachm and a half to two drachms shall have been given in the twenty-four hours, you obtain a real fall in the fever, but the action is very transient.

But what led me to abandon resorcin in the treatment of rheumatism and typhoid fever is not only its want of power, but also the toxic phenomena which I have observed. Resorcin is not only an irritant medicament, it is also a poison, and in the experiments which I made with Callias, we found that when we arrived at the dose of 30 centigrammes for each kilogramme of the weight of the body, we determined in the dog convulsive phenomena, and death when the dose reached 90 centimetres per kilogramme of weight. In the animals which succumbed to the effects of resorcin we noticed visceral congestions, and in particular very intense pulmonary congestions, as in the case of animals poisoned by phenic acid.

Man seems more susceptible to the action of resorcin than animals. Murrel has observed a case where 50 grains of resorcin administered in one dose determined grave symptoms of poisoning, from which the patient, however, recovered.

Hence, while recognizing that resorcin is less toxic than carbolic acid, I conclude that it is a dangerous antithermic, for I found in my patients affected with typhoid fever and treated by resorcin, the same depression of the forces, the same adynamia, the same pulmonary congestion which I had signalized in those to whom carbolic acid had been administered. I have therefore abandoned this medication, and I believe that even in Germany resorcin is little employed internally; it remains, on the contrary, a precious medicament for external use in the treatment of ill-conditioned wounds.

Kairin, which Fischer, of the University of Munich, discovered in 1882, was applied to therapeutics by Filehne, of Erlangen, and has been especially studied in Germany by Guttmann, by Gottlief Merkel, and in France by Dr. Hallopeau and his pupil, Dr. Girot, who has devoted his inaugural thesis to this subject.*

* Guttmann, Berliner Klinische Wochenschrift, No. 31. Gottlief Merkel, Deutsches Archiv für Klinische Medicin.

[redacted]

Kairin is a derivative of quinoleine; it is the methyluret of oxyquinoleine. This quinoleine, as you know, has but one very remote point of contact with quinine. It was obtained from coal-tar by Runge in 1873. Gerhardt obtained it by distillation of certain alkaloids—quinine, strychnine, cinchonine, with potassa—and the derivatives of this quinoleine have been especially well studied in France by Œschener of Coninck.

I shall not enter into this very complex and purely chemical question of the quinoleine series and of its derivatives; this I leave to my laboratory chief, Dr. Bardet; it is sufficient that I should tell you that chlorhydrate of kairin presents itself under the form of a crystalline powder of a straw yellow color. Its price is relatively high. It is soluble in water, and its solution has a bitter and disagreeable taste. Hence it is that it is administered in wafers or capsules.

Filehne advises to give every hour one of these wafers containing half a gramme of kairin-chlorhydrate. At the end of four doses, that is to say, at the end of four hours, the fever-fall is two or three de-

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Filehne, Berliner Klinische Wochenschrift, 16e numéro. Girat, Contribution à l'étude physiologique et thérapeutique du chlorhydrate de kairine (Thèse de Paris, 1883, No. 230). Hallepeau, Sur un nouvel antipyrétique, le chlorhydrate de kairine (Soc. med. des hôp., 23 mars 1883, et Bull. de thér., 1883, t. CIV, p. 241).

grees. Under the influence of these doses the patient sweats, feels depressed, and his urine takes on a black color, like that of individuals who have taken large doses of phenic acid. When the administration of the kairin is stopped, the patient rapidly recovers the temperature which he had before taking the medicine, and this new thermic elevation is preceded by an intense chill.

The transient duration of the antithermic action of kairin, and the production of the chill, is not the only inconvenience of this medicament. There is a much more serious evil resulting from it, for kairin acts on the red globules and on the oxyhæmoglobin, which it destroys. In their experiments on animals, Hallipeau and Gèrard had noted a modification in the color of the blood, which took on the color of sepia, and they had remarked numerous sub-pleural ecchymoses.

These accidents always occur when too large doses of kairin are administered, and it is a medicament which causes the death of a dog when doses are given which equal one gramme per killogramme of the weight of the animal.

Kairin is then an antithermic substance, but one which acts by diminishing the respiratory power of the blood, and by destroying the hæmoglobin. In some recent researches, Brouardel and Paul Loye have confirmed this view, and have shown that thallin and kairin have a similar action—that of destroying the hæmoglobin. Moreover, contrarily to what takes place in the case of the other antithermics, kairin and thallin have no action on the fermentations.

Kairin then ought to be discarded from therapeutics. It is a dangerous medicament, because it produces its antithermic effects by destroying the hæmoglobin and by profoundly altering the blood—circumstances which should be especially avoided in the infectious febrile diseases.

Thallin has many points of contact with kairin, belonging, like it, to the quinoleine series. It is the tetrahydroparamethyloxyquinoline. I do not know what is the value of this chemical appellation, but protest against any such barbarous scientific nomenclature. The name of thallin (*thallus, a green branch*) was given to it by Skraup, its discoverer, by reason of the emerald-green color which it assumes under the influence of perchloride of iron.

The sulphate and the tartrate of thallin are the salts in medicinal use. The sulphate is very soluble in boiling water, and in five times its weight of cold water. Thallin, as has been shown by Jacksch, of Vienna, lowers the temperature in the dose of from 25 to 50 centigrammes, and this without provoking sweating.* Huchard has confirmed these facts, and I have myself been able to observe the antithermic ac-

*Huchard, Sur un nouvel antipyrétique: la thallin (Union Médicale, No. 2, Jan. 3, 1885, p. 13).

tion of thallin. Unhappily, thallin, like kairin, lowers the temperature not by acting on the thermic centres, but by diminishing the respiratory power of the blood and dissolving hæmoglobin, and the researches of Brouardel and of Paul Loye seem to us demonstrative of this fact.*

Thallin is the most powerful of antithermics, and we have seen Jaccoud, with doses of one gramme administered every half hour in divided doses during the 24 hours obtain, in a tuberculous patient, a fever-fall of five degrees, so that the temperature of the patient was reduced to 32.4°, and strenuous efforts were required to arouse him from the state of collapse into which he was plunged.[1] It is necessary, then, to be very chary in the employment of thallin, and to give it only in very small doses of not more than four grains; and I come now to antipyrine, which, till we can find something better, will remain the best and the least dangerous of our antithermics.

As in the case of kairin, it is to a chemist of Munich, Ludwig Knorr, that we owe the discovery of antipyrin, and, again, it was Filehne, of Erlangen, who was the first to experimemt with it. The chemists are not yet agreed as to the exact name which we ought to give to antipyrin. Some think that it should

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* Dr. Rudolf von Jacksch, assistent der Medizinische Klinik in Wien, Thallin, ein neues antipyreticum (Wr. Med. Wochenschr., No. 48, 1884).

be called *dimethyoxyquinizine;* others, on the contrary, call it *methylated oxymethylquinizine.*

Antipyrin presents itself under the form of a reddish-gray crystalline powder, very soluble in water, and with a slightly-bitter s vor, which is not unpleasant to the taste. It may be given by the mouth, by clysters, or by hypodermic injections. When given by the mouth, it is in sweetened water, rendered aromatic by a little peppermint or lavender, that you can best prescribe this medicament.

The physiological and toxic action of antipyrin has been well studied in France and in foreign lands. In France it was Huchard who was one of the first to make known to us the therapeutic and toxic action of this substance, and you will find in the thesis of his pupil Arduin the principal facts resulting from this study.*

Antipyrine is toxic, but it is much less so than resorcin, which again is less toxic than phenic acid; and while it takes less than one gramme of resorcin per kilogramme of weight to kill a hare, more than 1½ grammes of antipyrine is requisite to produce the same fatal effect. The symptoms of poisoning are, however, almost alike in both cases; these are of tetanic and paralytic character, exactly resembling those which characterize strychnine-poisoning. It is

*Arduin, Contribution à l'étude physiolgique de l'antipyrine (Thèse de Paris, Feb., 1885).

not, then, doubtful that antipyrine acts on the cerebro-spinal axis, and it is probable in modifying the thermogentic centres that it depresses the temperature.

This medicament has little action on the circulation. Some affirm that it augments the arterial tension; others, on the contrary, that it lowers it; but everybody is agreed in recognizing the little influence that it has on the number of the pulsations. But, unlike kairin, it does not seem to modify the blood, and in particular the hæmoglobin. In fine, always, with reference to this action on the circulation, do not forget to note the curious hæmostatic effects which Henoque has attributed to antipyrine—a hæmostatic action which seems to be superior to that of ergotine and perchloride of iron. It is well to remember this fact, *à propos* of the treatment of certain hemorrhages, and in particular of hæmoptysis.

Antipyrine is eliminated by the urine, and this elimination is easily recognized by the aid of perchloride of iron, which gives rise to a reddish-purple color in the urine which contains antipyrine. This medicine diminishes the urine; and I have been able to observe this diminution in a patient affected with simple polydypsia, to whom I had administered antipyrine. It has also a notable action on the perspiration, which it augments, and this is ever a disadvantage in administering antipyrine to tuberculous patients. In fine, I shall have finished what concerns the physiological action of antipyrine when I have stated that, like the phenols and oxyphenols, it is an antagonist of fermentation.

In what dose should antipyrine be administered? If we follow the precepts laid down by Filehne, we should thus give it: To an adult febricitant 2 grammes of antipyrine in one dose This produces at once a fall in the pyrexia of one or two degrees; then at the end of four hours, at the moment when the temperature tends to regain its former height, you repeat the dose of 2 grammes, then, four hours after, when the fever again begins to rise, you give 1 gramme, and thus obtain a thermic depression which may last for 24 and even 48 hours. This is the practice first followed in France, but we have had to abandon it in the case of tuberculosis by reason of the profuse sweating which this mode of treatment causes.

Huchard has proposed to diminish the dose to 50 centigrammes, which he would give only every other day. Darenberg gives much larger doses, even 6 grammes a day, to his tuberculous patients. But this question of dosage is entirely relative to the nature of the febrile process, and I ought, in this connection, to give you more precise information. The study of the new antithermics has, in fact, shown us that, according to the nature of the fever, the hyperthermia presents a variable resistance to the same antipyretics; so that, with an equal temperature of forty degrees in a tuberculous patient and in a typhoid fever patient, 50 centigrammes of antipyrine will cause a fall of temperature in the first, while in the second it will be without effect.

However this may be, we may give antipyrine either in the period of apyrexia, or during the fever. In the first event, we prevent the return of the hyperthermia; this is the practice which Darenberg has adopted, who gives to his tuberculous patients fifteen grains of antipyrine before the onset of the fever, *i. e.*, before the thermometer has attained 37.5° C.; then he gives another dose of 15 grains whenever, in the course of an hour, the temperature rises more than three-tenths of a degree.

The other method consists in giving antipyrine during the fever. Ordinarily it is at the end of half an hour that the fall is produced, a fall which is generally preceded by a marked sudoral period. At the end of four hours, according to the febrile process, the temperature tends again to rise. Hence it is difficult to lay down precise rules for the administration of this medicament, and it is necessary to depend strictly on the thermic curve, and whenever the thermometer tends to overpass certain limits, say 38, 39 and 40 degrees, give a new dose of antipyrine, which should vary, according to the intensity of the fever, from 7 to 15 grains.

At the same time we can affirm with assurance that antipyrine may be given without any harm in fractional doses up to one and a half and even two drachms in the twenty-four hours.

Now that you are acquainted with these different therapeutic agents, I shall, in the next lecture, set forth the benefits and advantages which you may derive from these different medicinal agents.

CHAPTER XII.

INDICATIONS FOR THE ANTITHERMIC MEDICATION.

GENTLEMEN: Fever, as we have said, is characterized by an augmentation of the pulse and temperature, and we have proved both of these phenomena to be due to an increase of the combustions of the economy. Is this hyperthermia attended with danger, and is it necessary to endeavor to bring back the inordinately high temperature to a lower figure? First of all, you must be aware that to reduce the temperature and to combat the hyperthermia is not to annihilate the fever, nor even to reach the cause which has provoked it. To depress the temperature of a man affected with pneumonia is not to cure the pneumonia. To cause typhoid fever so to undergo evolution that the temperature shall never rise above 38° C. (100° F.), and to maintain the heat-curve on a horizontal line, which is quite possible at the present day, thanks to the antipyretics of which I have spoken, is not to cure the fever; and this is so true that it is a fact that by the employment of the antithermic medication we do not diminish by one day or one hour the duration of the febrile malady. The antithermic medication, then, influences only one of the elements of the fever.

I share in this regard the views of my colleague and friend, Dr. Huchard, who has said that in clinical practice we ought to have no *antithermic* medicaments, but rather such as are *anti-hyperthermic*, meaning by these words that it is only against the excessive elevation of the temperature, and not against the fever, and the determining cause of the latter, that we should make use of the medicaments whose history I have traced for you.

Has the hyperthermia, then, any danger by itself? Here there have been adduced, in order clearly to set forth the dangers of hyperthermia, three orders of proofs: the first derived from observation of the fever itself, the second from pathological anatomy, the third from physiological experimentation.

1. As for the proofs derived from observation of the fever itself, the German school has maintained that it is to the elevation of the temperature that are to be referred on the one hand the augmentation of the pulse and the increased frequency of the respirations, and on the other, the aggravation in the general symptoms and the delirium; that, in a word, all the grave symptoms of the disease result from the sole fact of the hyperthermia. To give a more certain proof of this affirmation, the German physicians have pretended that it is sufficient to bring down the temperature to cause all these grave symptoms to disappear. There is here, it must be admitted, an evident overstatement; and it seems to me difficult in clinical practice thus to separate the hyperthermia from the other grave symptoms which accompany it. All these

phenomena constitute a complex syndrome which affirms the gravity of the disease; and if the state of the forces is enfeebled, if delirious manifestations supervene, it is not only because the temperature is raised, but also because the general condition is aggravated.

Take a case of infectious pneumonia. You can artificially depress the temperature, but you cannot by that diminish the gravity of the disease, and the patient may even succumb with a temperature almost normal. Observe how it is in typhoid fever: you will see patients who bear their disease very well with temperatures elevated to 40° C. or above, and this without delirium; others, on the contrary, present an ataxo-adynamic state of the greatest gravity, with depression of the forces, despite a temperature very little above the normal.

Even when we interfere with our antithermic medicaments we obtain a fall of the temperature, it is true; but as we combat only one element of the disease, we do not cause disappearance of the latter, which, according to the type, remains grave or benign. I am well aware that in speaking thus I am setting myself against the views of Brandt and his school, which assert that by employing the method of cold baths from the commencement of the dothinenteritis you will reduce all forms of typhoid fever to a similar benign type. Now that we possess antipyrine, which is much more powerful than cold baths to reduce the temperature, we shall be in condition certainly to determine if the statement of the physician of Stettin is correct; but what I can affirm, as a conclusion from the few cases of typhoid fever which I have already treated with antipyrine, is that, while lowering the temperature, this medicament has no influence on the march of the disease.

So, then, from a clinical point of view, the hyperthermia is not the sole element of the fever, and it is not correct to say that it holds under its dependence the other grave manifestations.

2. Let us see if the anatomical proofs are more convincing.

Liebermeister and his school have taught that the febrile hyperthermia entails grave lesions in the economy which affect the liver, the kidneys, and in particular the heart and the muscles These last lesions, as you well know, have a marked importance; it is in fact certain that those curious alterations described by Zenk, which pertain especially to the respiratory muscles, as well as the cardiac degenerations, are a frequent cause of death in typhoid patients, but are they indeed the result of elevated temperatures? If it were so, you would understand the importance of actively interfering to combat this elevation of temperature. Unfortunately, there is nothing demonstrative in this respect.

Prof. Hayem, in his interesting researches on the symptomatic myosites,* has shown that it is especially in the febrile infectious diseases that these profound disorders of the nutrition of the muscular fibres are produced, and that in these anatomical modifications the general empoisonment of the economy plays a more considerable part than the hyperthermia. One may even go further to-day, I believe, and say that the proto-organisms (microbes), which constitute the very essence of these diseases, must be the principal efficient cause of the symptomatic myosites.

Vallin has, moreover, shown us by direct proof that in an individual suffering from typhoid fever of apyretic form, and whose temperature never exceeded 37.6° C., there existed a very extensive vitreous degeneration, with ruptures and hemorrhages of the muscles of the abdomen and thigh, showing conclusively that there are grave typhoid fevers which are almost apyretic. As you then see, the anatomical proofs are not more demonstrative than the clinical proofs. Let us now examine the evidence which physiological experimentation has to offer. This evidence seems at first sight to be convincing.

3. Physiologists have shown that when by artificial means you raise the temperature of the animal, death supervenes when the temperature exceeds by four or five degrees the normal figure. Claude

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*Hayem, Arch. de Phys., Paris, 1870.

Bernard, in his celebrated experiments made on different animals, has shown that death takes place in the bird when the temperature attains 48° to 50° C.; in mammals when it reaches 38° to 40° C.; and in cold-blooded animals when the thermometer indicates 37° to 40° C. The toxic scene is almost always the same in animals; that is to say, you see the circulation and respiration accelerated, convulsions supervene, and the animal dies suddenly, with an outcry.

Vallin, who has studied experimentally the phenomena of insolation, has divided into three periods the characteristic symptoms. In the first there is acceleration of the circulation and respiration; in the second period the respiration becomes retarded and sighing, and there is prostration; the third period is characterized by convulsions, coma, and death.

The post-mortem appearances in animals which have thus succumbed to artificial augmentation of heat are characterized by the early supervention of cadaveric rigidity, by the loss of electric excitability on the part of the muscles of the economy, and, lastly, by the black and tarry aspect of the blood, which loses almost all its oxygen.

Such are the results of experimentation. Are they completely applicable to the human subject? I do not think so. There is in fact a very great difference between the fever patient whose temperature is augmented by the acceleration of the combustions of the economy and the animal whose temperature has been raised artificially. Recall to mind what I said to you in a recent lecture *a propos* of the theories of fever relative to the regulation of the temperature. Leibermeister has well shown that the very essence of the febrile process is the regulation of the temperature of the body by a standard more elevated than the normal ; nothing like this takes place in experimentation on animals, and as our colleague Peter lately very cleverly said, Claude Bernard in his celebrated experiment on pigeons* performed a cooking experiment rather than one in experimental physiology, since he really heated his pigeon up to the roasting-point. It will not do, then, I repeat, to deduce from these experiments conclusions applicable to the febrile process, and they ought to be exclusively applied to the explanation of insolation, or *coup de soleil.*

You see, then, that if hyperthermia is a grave symptom in the course of febrile affections, it would be a mistake to believe that in bringing back the temperature to the normal, you cause all the untoward symptoms to disappear. Nevertheless, this hyperthermia ought to engage your attention like all the other symptoms accompanying the febrile process, and just as we endeavor to raise the state of the general forces, it is our duty when the temperature overpasses a certain level to bring it down to a lower figure; and taken in this acceptation, the antithermic

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*Claude Bernard, La Chaleur Animale, Paris, 1874.

medication ought to find a place by the side of calm
tive and tonic modes of treatment which we emplo
in the clinical management of pyrexias.

Within certain limits the divers fevers respon differently to the different antithermic medicament and this is one of the most interesting points in th history of antipyretic medication, insomuch that o four individuals having a temperature up to 40° C. and who, if you were to judge by the sole inspectio of the temperature, were having the same kind o fever, but one of whom is affected with intermitten fever, another with acute rheumatism, the third wit the hectic fever of tuberculosis, the fourth wit typhoid fever, none of these patients would experienc just the same effects from the same antithermic medi cines. In the case of the first, it is sulphate o quinine which would act the most effectively; in tha of the second, it is salicylate of sodium which shoul be employed; in that of the third, antipyrine in smal doses will give the best results (such doses, for in stance, as 7 to 15 grains a day), while, on the othe hand, these small doses will be insufficient to reduc the temperature in our fourth patient affected wit typhoid fever, and to bring down the pyrexia in thi patient, we shall have to give much larger doses This is a very important point, on which I cannot to much insist, and which shows the specialization of th different antithermics whose history I have traced.

As for antipyrine, its elective action is see particularly in the fever of tuberculosis, and we have here a result which is very remarkable, for up to the time of the discovery of this medicament we were almost impotent against this hectic fever. Sulphate of quinine, even in doses of 12 to 15 grains, scarcely reduces this fever, while producing phenomena of cerebral excitation, and this is why Jaccoud proposed to substitute for it salicylic acid. The disadvantages of the latter medicine are considerable, for in large doses it produces, like quinine, vertigo and cerebral complications, while in small doses its effect is almost *nil*.

Antipyrine moreover, when given in the doses indicated by Filehne, namely, 75 grains in three doses—30 grains at first, then two hours after, 30 grains, then after two hours 15 grains—has the inconvenience of determining profuse sweats which exhaust the patient. But now that we employ the method laid down by Huchard, namely, to give only 8 grains every day, or every two days, we derive from this medication a real benefit. The patient does not experience that poignant heat of the skin which characterizes the larger doses, his sleep is better, his sweats are lessened, and the antithermic medication coupled with superalimentation, and with medicaments which modify the expectoration, enables the patient to live longer and to struggle to some advantage against his disease, even if the case be incurable.

Daremberg nevertheless employs a different method in the administration of antipyrine. He gives it especially in the apyretic period, and he exhibits it not to combat a febrile paroxysm already existing, but to prevent one from coming on. He administers as much as 90 grains of antipyrine a day in fractional doses of 15 grains. He affirms that by this means he not only absolutely arrests the fever, but also avoids the depressant and sudorific effect of the medicine.*

Antipyrine is also applicable in those ephemeral fevers, often so intense, which accompany amygdalitis, or quinsy. You are all familiar with this febrile state, which is sometimes so grave and alarming. The skin is burning hot, and the temperature sometimes exceeds 40° C. There is agitation and even delirium, and as local signs you notice nothing but a little redness in the fauces. Here also antipyrine will give you good results. It brings down the temperature, and by the perspiration which it produces, it alleviates the dryness of the skin.

In pnenmonia you can also make use of antipyrine when the temperature becomes too high. In fine, among the eruptive fevers I will mention scarlet fever as a disease where the powerful antithermic action of this medicament will find its indications in the anomalous and hyperpyrexial forms.

As for quinine, it will remain the antithermic

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*Daremberg, on Antipyrine in the Fever of tuberculosis. (Bull. de Ther., July 30, 1885).

medicament *par excellence* of morbid periodicity; for, despite the action so marked and powerful of the new antithermics, they seem to have only an uncertain effect in intermittent fever. There have, indeed, been several trials made of late with resorcin and quinoleine, but notwithstanding the favorable results obtained, especially with the latter medicament, quinine still remains the most powerful remedy against fever and ague.

As for the fevers of rheumatic nature, it is salicylic acid, or rather salicylate of sodium, which you should employ. Here the medicament has not only an antithermic action, but also an analgesic action of the most marked kind, and constitutes a real specific medication in acute articular rheumatism. Bernheim of Nancy has indeed maintained that antipyrine gives the same results as the salicylic medication in acute articular rheumatism, but the few trials which we have made in our hospital with antipyrine in rheumatism have not confirmed the statements of the professor of Nancy; and while we have obtained quite favorable results from this remedy, they are nevertheless inferior to those obtained from salicylate of sodium.

Perhaps we should make an exception in the case of rheumatism of hyperpyrexial type, or cerebral rheumatism, where possibly thallin, which proves so powerful in small doses, may be indicated. As for typhoid fever, I recognize the fact that the new antithermics, while enabling us to bring back the temperature to the normal, do not modify the march of th disease, and in very many cases where we have em ployed antipyrine in the treatment of typhoid feve we havę indeed depressed the temperature, but a soon as we left off the administration of the medi cament the hyperthermia reappeared with a nev intensity, and the grave forms continued grave. ought, however, to tell you that the administration o antipyrine presents no ill results, and that evel when given in the dose of a drachm a day, in divide doses of 15 grains each, this medicine has not seeme to do harm.

For my part, till something better is found, prefer baths in typhoid fever to all these medicaments I do not, indeed, mean cold baths, after the method of Brandt, but tepid baths. I have for more than ten years extolled the advantages of these baths over cold baths, and my opinion is every day being confirmed. I administer these baths at a temperature of between 35° to 36° C. (95° to 97° F.), so that there shall be at least three degrees of difference between the temperature of the patient and that of the bath, and I prolong the bath half an hour, three-quarters of an hour, according to the strength of the patient, which I support by giving at the same time alcoholic stimulants and broth.

I obtain from these baths thus administered a triple effect: they keep the skin cleansed; they cause an abatement of the nervous symptoms, producing repose and calm; and they have an undoubted antithermic action.

The application of new antithermics to typhoid fever well shows that the fever is not the only enemy, and that in reducing the temperature alone, you only attack the disease in one of its phases; and that if, in my opinion, the cold baths, and, better still, warm baths, are preferable, it is because their effects are complex, and are addressed rather to the troubles of the nervous system than to the hyperthermia.

Such are the considerations which I desired to present to you respecting the antithermic medication. In the next lecture I shall show you the progress which therapeutics has made in calming and removing pain; in other words, I shall set forth the new anæsthetic and hypnotic medications.

CHAPTER XIII.

ON THE NEW HYPNOTICS.

GENTLEMEN: "It is a divine work to relieve pain," says Hippocrates; and, in accordance with this verity, the efforts of physicians have in all ages been put forth to mitigate the sufferings incident to the diseases of humanity. This is often the chief duty of the medical man as he finds himself in the presence of a fatal malady.

To-day the means for alleviating pain may be divided into four great groups: 1, hypnotics, which produce sleep, and thus bring the desired repose and calm; 2, analgesics, which are addressed principally to the element of pain; 3, anæsthetics, which extinguish sensibility, in whole or in part; 4, in the last group are placed medicaments which diminish the excitation of the nervous system, and which have been of old described under the name of *sedatives* or *anti-spasmodics.*

Each of these groups has received precious additions the past few years, and I propose now to devote my attention to the study of the first, namely, the new hypnotics.

Hypnotics (from ὑπνόω, I sleep) are medicines which produce sleep; and in order that the way these substances act may be understood, I shall briefly sum up the physiological phenomena which take place during sleep.

Many theories have been put forth as to the physiology of sleep, but at the present day most physiologists are agreed that the proximate condition of sleep is a diminution in the cerebral circulation—a real transient anæmia of the brain. It is well known, since the researches of Quetelet, and especially of Milne-Edwards, whose recent loss science deplores, that the general circulation is retarded during sleep, that the number of pulsations is reduced, and that the combustions of the economy are slowed. The cerebrum participates in this diminution of the circulation, and we have a certain proof of this in the various experiments made by Hammond and Durham, according to which, in dogs whose crania had been trephined, examination of the brain during sleep revealed a considerable diminution of the intracranial circulation.

These facts were confirmed in 1877 by Salathé, who showed, in his thesis on the movements of the brain, that during sleep there is a notable lessening of the cerebral expansion—an expansion which you well know is in direct relation with the arterial irrigation of the encephalon. Finally, these facts have been verified by the remarkable experiments of Mosso. This physiologist has been able, in the case of a woman whose cranium had in part been destroyed by syphilitic necrosis, to register the expansive movements of the brain, and his researches have demonstrated these two important facts: that every intellectual effort augments the circulatory activity of the brain, and that it is during sleep that these movements of expansion attain their minimum.

Hence, then, every medicament which has for its effect slowing of the cerebral circulation may become a hypnotic, while, on the contrary, medicaments which congest the encephalon cannot be ranked in this category. It is understood that in the hypothesis which I have invoked to explain sleep, the anæmia and the congestion of the cerebrum must not exceed certain limits, for when the cerebral anæmia is extreme it produces convulsive paralytic phenomena; and on the other hand, when the congestion is too intense, there supervenes a state of sopor which simulates natural sleep.

But, it may be asked, what are you going to do with opium and its alkaloids, which are known to be provocative of cerebral hyperæmia; are they not hypnotics? I reply without hesitation that I consider opium much more an analgesic and stimulant than hypnotic. In my opinion, opium does not cause sleep, despite the *virtus dormitiva* imputed to it by the medical undergraduate in the immortal comedy of "Malade Imaginaire." I know that in affirming this view I oppose traditional beliefs, but the more I study this question of opium, the more I am disposed to maintain my opinion.

Opium and morphine taken in therapeutic doses do not determine true sleep; they produce a special state of drowsiness, of reverie, and even of beatitude, but during which the cerebral functions, powerfully excited by the congestion determined by the opiate, continue to be active, and often in an extraordinary degree. These properties of cerebral excitation invest this drug with a powerful charm, and constitute the main motive to that modern vice described under the name of morphiomania.* I appeal in this connection to all who have ever made use of opium, and it will be found that the greater number will testify that they have found in this drug not a sleep-producer, but a potent calmer, under whose influence every painful consciousness is allayed.

Two new medicaments deserve especially to be studied among the hypnotics—chloral and paraldehyde. I shall be brief respecting the first of these substances, for we are all now quite familiar with that admirable medicament which Liebreich introduced into therapeutics in 1869; to-day it is by the thousands of kilogrammes that chloral is used. I must, how-

* This word, first proposed by Livenstein, or the more grammatical word morphinomania proposed by Prof. Ball, seems to me a better term to apply to the abuse—at the present day so often made—of morphine, than morpheomania, an appellation suggested by Zambaco, of Constantinople; it is not sleep that is sought by these victims of the morphine habit, but the excitation which this alkaloid produces.

ever, call attention to the fact that this drug is an irritant, and in 1871, during my researches with Herne, which enabled us to affirm the antiseptic properties of chloral, we had a good deal to say about the caustic action of this body. It is not, then, surprising, to encounter in persons who make an abuse of chloral (for there are *chloralics* as well as *alcoholics*) gastric troubles precisely similar to those determined by the alcohols.

It is, then, always necessary to dissolve chloral in a great quantity of menstruum, and I have generally been accustomed to order this medicine in egg and milk emulsion. Despite these precautions, chloral is often badly supported; in this event, I recommend its introduction by the rectum, and have found it well tolerated when given in the form of enema, the dose of the hypnotic being rubbed up with a small cup of egg and milk. As for the administration of chloral by the hypodermic method, this mode ought to be reserved for cases of extreme urgency, such as strychnine-poisoning and puerperal convulsions, for the irritant action of these injections frequently determines eschars more or less extensive.

Many have been the hypotheses framed to explain the action of chloral; some authorities basing themselves on such experiments as those of Personne, who found chloroform in the blood of chloralized animals, have maintained that it is by being decomposed into chloroform and formic acid that chloral acts. Others, on the contrary, have asserted that it exerts its power by properties of its own, not by the products of its decomposition. I quite agree with this view, and have no doubt that it is by acting directly in the state of chloral on the nervous elements of the brain and spinal cord that this drug determines its hypnotic and anæsthetic phenomena, and I invoke in support of this opinion the experiments which I performed a dozen years ago, and which I now reproduce before you.

You see before you a hare, under whose skin we will now inject a solution containing 45 grains of chloral. The animal, after uttering several outcries, determined by the local caustic action of the solution, falls rapidly into a state of anæsthesia, absolutely similar to that caused by chloroform, and this condition lasts till the chloral ceases to be eliminated by the lungs and urine unchanged. How are we to explain the speedy total anæsthesia of this animal, if the theory of the breaking up of the chloral into formic acid and chloroform is adopted, a decomposition which requires a long time for its accomplishment, and which produces so feeble a liberation of chloroform that anything like profound anæsthesia would be impossible with such doses? But, while acting in the form of unchanged chloral on the nervous elements, this substance has the same action as chloroform—that is to say, it produces anæmia of the brain. In this regard the experiments of Hammond are absolutely demonstrative. Chloral, then, must be classed among the true hypnotics—that is to say, among the medicaments which produce sleep by anæmiating the cerebro-spinal axis.

But by the side of these hypnotic properties it will not do to forget that chloral has an action on the heart, and, as Gubler has said, it is a cardiac poison in large doses, and in chloralized animals the heart is found in diastole. These three chief effects of chloral: its property of decongesting the cerebro-spinal axis, which renders it hypnotic, its action on the heart, and, lastly, its irritant effects on the stomach, ought to serve as our guide in the therapeutic application of this admirable medicament. In all the pyrexias of congestive form chloral will prove itself superior to opium as a sleep-producer; also in typhoid fever, in pneumonia, in alcoholic delirium, it is to chloral that we should resort to calm the agitation of our patients. In cases of rebellious insomnia in neuropathic patients, chloral is the hypnotic to choose. On the other hand, chloral should be interdicted to persons suffering from cardiac affections, and in particular to those that have aortic stenosis or insufficiency; here opium is far superior. We should also refrain from prescribing chloral for patients affected with stomach disorders, for its irritant local action singularly aggravates the dyspepsias, especially those of irritative form. Finally, in diseases of the larynx and pharynx, the administration of chloral by the mouth becomes very difficult, by reason of the sensation of burning in the back of the throat which attends the swallowing of the chloral potion. But here again we can employ the enema of chloral, which is one of the best modes of introduction of this medicament.

Chloral, again, proves a good medicament in certain forms of poisoning, especially in strychnine-poisoning, delirium tremens, and the uræmic poisoning of eclamptic form. In all these maladies it gives good results, but inferior, nevertheless, to those obtained by paraldehyde, of which I am now going to speak.

The aldehydes, taken in their aggregate, constitute to-day a special group of considerable size, to the study of which my colleague and friend, Dr. Bourgoin, has devoted an entire volume.* They are, as we all know, dehydrogenated alcohols, or, better still, the hydrides of alcoholic acid radicals. We shall here occupy ourselves only with ethylaldehyde, or, as it has been called, acetic aldehyde, or, better still, hydride of acetyl, having for its formula C_2H_4O, the formula of ethyl alcohol being C_2H_6O.

Paraldehyde is a body which is constituted by the union of three atoms of aldehyde, and has for its formula $C_6H_{12}O_3$, or, preferably, $3\ (C_2H_4O)$. Paraldehyde, when kept at a temperature of 10° C., is a solid

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* Bourgoin, Des Aldehydes (Encyclop. Chemique, 1885).

crystalline body, which melts above the temperature just given. This fusion-point enables us to distinguish the pure paraldehydes from those that are not pure. In commerce two kinds of paraldehydes are to be found—the one liquid at 0°, the other solid at 10° C. It is to this last alone that the name of pure paraldehyde belongs.* This paraldehyde pure, is soluble in alcohol and in water: ten parts of water dissolve one part of paraldehyde, and this degree of solubility enables us to formulate the different preparations of which I am going to speak, and among which I shall signalize here especially two formulas which have been proposed by Yvon, the one a potion, the other an elixir. The potion is as follows:

> Paraldehyde, 2 grammes (ʒ ss);
> Linden [or camphor] water, 70 grammes (℥ ii and ʒ iiss);
> Tincture of vanilla, gtt. xx;
> Syrup of wild cherry, 30 grammes (℥ i).
>
> M.

The formula of the elixir is as follows:

> Paraldehyde, 10 grammes (ʒ iiss);
> Alcohol at 90°, 48 grammes (℥ i and ʒ ivss);
> Tincture of vanilla, 2 grammes (ʒ ss);
> Water, 30 grammes (℥ i);
> Simple syrup, 60 grammes (℥ ii).
>
> M.

A tablespoonful of this elixir contains 1 gramme

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* Yvon.

(15 grains) of paraldehyde. The potion may be given in the same dose. In my own practice I generally use the following formula, which is the same as that of solutions of iodide and bromide of potassium:

Take of paraldehyde 15 parts (or ℨ iij);
Water, 350 parts (or ℥ vi).

Each tablespoonful contains 1 gramme (15 grains) of paraldehyde, and I give the solution with some kind of liquor—rum, whiskey, or kirsch. Paraldehyde has a quite special, disagreeable odor, which resembles the smell of a tippler's breath; and it is by mixing it with alcoholic liquors of pronounced taste (like kirsch or rum) that you best get rid of this taste and odor. Dr. Desnos makes use of mucilage of gum sweetened with gooseberry syrup for vehicle.

Paraldehyde has also been given in the form of enema, especially in insane asylums, and Kéraval and Nerkam have employed the following formula:

Paraldehyde, 2 grammes (ℨ ss);
Yolk of one egg;
Infusion of marshmallows, 120 grammes (℥ iv).
M.

These physicians claim that enemata of paraldehyde are superior to enemata of chloral, and according to them the active dose by enema would appear to be one-half less than by mouth. These same practitioners have employed paraldehyde in subcutaneous injections (always in insane patients). Their formula is as follows:

Paraldehyde, 1 part;
Cherry-laurel water, 1 part;
Distilled water, 3 parts.

Each gramme (15 grains) of this solution represents 20 centigrammes (3 grains) of paraldehyde. These injections, according to their statement, have always been safe, though very painful. The experiments which I have made with paraldehyde in subcutaneous injections have almost always determined in my patients not only pain, but inflammatory indurations, and even abscesses. I think, therefore, that we ought absolutely to banish from therapeutics subcutaneous injections of paraldehyde.

In what dose should paraldehyde be administered? Ordinarily we may obtain the desired effect by giving from two to three grammes (30 to 45 grains), and this in one dose.

But, before going further, it is necessary to know the physiological action of this substance.

In 1878, in our experimental researches undertaken to ascertain the toxic power of the alcohols (I allude to the labors of Audigé and myself), we took care not to omit the aldehydes; and resuming the experiments already made by Lussana and Albertoni in 1874, we showed that in the dog we could cause death with extreme rapidity when we introduced under the skin of this animal from 1.60 gramme to 2 grammes of paraldehyde per kilogramme of the weight of the body, and that in less doses we produced a very speedy and profound intoxication; therefore we have assigned to paraldehyde an important part in the poisoning produced by badly rectified or impure alcohols, which contain always notable quantities of this substance.

Since the introduction of paraldehyde I have desired to take up anew this study, and see if any useful therapeutic applications could be derived from it. Acetic aldehyde cannot be employed of itself. This substance is so volatile that when you introduce a teaspoonful of it into the mouth it immediately becomes vaporized, and cannot be swallowed. I then undertook to employ a solid and stable combination of aldehyde, the aldehydate of ammonia, a crystalline and perfectly soluble body; but the aldehydate of ammonia is irritant and caustic, and when injected under the skin or introduced by the mouth it produces by its causticity such disorders that it cannot be employed.

Paraldehyde was introduced into therapeutics by Cervello in 1883; then appeared successively the labors of Albertoni and of Morselli in Italy, of Gugl and of Peretti in Germany, of Masius in Belgium, and, finally, my own studies in this country; and you will find in the remarkable thesis of my pupil, Dr. Coudray, defended April 25, 1884, the principal conclusions at which we arrived. Still more recently our colleague and friend, Dr. Desnos, has communicated to the Academy of Medicine the results of his experiments.*

We experimented with paraldehyde on different animals—frogs, hares, guinea-pigs, and dogs—introducing the toxic agent under the skin. When in the dog the dose of 2 grammes per kilogramme is attained, death is rapidly caused, with complete anæsthesia and loss of all the reflexes; and if the phenomena which manifest themselves are attentively observed, it will be seen that paraldehyde affects successively the cerebrum, the spinal cord, and the bulbus. This loss of the reflexes produces a double action on the circula-

*Cervello, Paraldeide come antagonista della Stricnina (Arch. per le Scienze Mediche, t. vii. 6); Ueber die physiologische Wirkung des Paraldehyds und Beitrag zu den studien ueber das Chloralhydrat (Arch. f. experim. Pathol. und Pharmacologie, t. xvi. cah. 3 et 4); Sull'azione fisiologieca della Paraldeide contributo allo studio del Cloralio idrato (Arch. per le Scienze mediche, t. vi., No. 12). Albertoni, Archives italiennes de bioligie, t. iii, fasc. 2. Morselli, Irrenfreund, t. xxvi. 3, 1883. Bergesio, Rivista sperimentale di freniatria e di medicina legale, 3e fascicule, 1882. Peretti, Ueber die schlafmachende Wirkung des Paraldehyds (Berl. Klin. Wochenschrift, No. 40, 1883). Gugl, Ueber Paraldehyds als schlafmittel (Zeitschrift f. Therapie, 1883, 1er août). Berger, Breslauer ærtzl. Zeitschr., t. v. 6, 1883. John Brown, On the Therapeutic and Hypnotic Employment of Paraldehyde (Brit. Med. Journ., May 19, p. 956, 1883). Langreuter, Arch f. Psych. Nervenkrankheiten, xv. fasc. 1. Coudray, De la paraldéhyde (Thèse de Paris, 1884). Desnos, De la paraldéhyde (Bull. de thér., t. cix , 1885, p. 52).

tion and on the respiration; there is a retardation in the movements of the heart and diminution in the arterial tension, as well as in the respiratory movements. Paraldehyde, then, produces effects similar to chloral and chloroform, which cause sleep and anæsthesia by anæmiating the cerebro-spinal axis. It is, then, a hypnotic in the true sense of the word. The sleep determined by paraldehyde is very like that produced by chloral; it is generally calm, but in many cases it is preceded by a period of excitation or agitation resembling alcoholic intoxication.

To return to the physiological action. Despite the affirmation of Quinquaud and of Henocque, who have maintained that paraldehyde acts on the hæmoglobin, causing the production of methæmoglobin, the experiments of Hayem tend to show that this view is erroneous, and that paraldehyde has little or no action on the coloring principle of the blood-globules.

But there is one point pertaining to these physiological studies which is exceedingly interesting, and which has been put in clear light by the Italian experimenters, and confirmed by the experiments of Coudray. I refer to the antagonism which exists between strychnine and paraldehyde. The experiment which I am going to perform before you will enable you to understand this antagonism.

You see before you two hares. In one of them we inject 2 grammes of paraldehyde into the cellular tissue, the other receives none. A little strychnine is now introduced in the same way. The hare is extremely sensitive to this poison, and 1-300 of a grain is sufficient to cause death. Under the skin of the hare which has received no paraldehyde 1-60 grain of strychnine is now injected. This animal immediately falls into the tetanic convulsions which characterize this species of poisoning, and shortly succumbs. In the hare that was dosed with paraldehyde, 1-12 of a grain is now injected (we may even go so far as one-tenth without causing death). You see that no serious results follow, proving that the hare that is treated with paraldehyde will bear doses thirty times larger than the fatal toxic dose. It is the same with the dog; an animal of middling size will succumb when you administer to it 1-30 of a grain of strychnine. When it is under the influence of paraldehyde you may give it 1-6 of a grain without producing death. How are we to explain this antagonism?

This question deserves a brief consideration. We can give a physiological explanation, based on a curious experiment of Claude Bernard and Paul Thenard. They etherized hares, then injected anhydrous prussic acid under the skin. Whenever the animal was plunged into the anæsthetic sleep they could give him quite large doses of prussic acid without producing poisoning; but toxic symptoms appeared as soon as the animal recovered consciousness and sensibility.* The experiment to which I have just alluded

*Dujardin-Beaumetz, "Clinical Therapeutics," p. 15 (edition of G. S. Davis, 1885).

[redacted]

in order to produce their effects, to act on the nervous elements in a perfectly healthy state; and it is sufficient there shall have been cellular impregnation by another medicament, or a molecular modification, however inappreciable, in order that the natural effect of a drug shall not be felt; and it is in this way, in my opinion, that we are to explain the astonishing tolerance which certain inebriates manifest to substances of the most toxic nature. It is for this reason that in delirium tremens one may give immense doses of opium, or of strychnine, etc., without dangerous results. Likewise maniacal patients, for similar reasons, often show a strange tolerance for certain poisons. I will take as example the treatment of certain forms of madness by preparations of morphine. There are, in fact, cases where physicians will not hestitate to inject at once several grains of this alkaloid, and this without any bad effects.

In a similar way I would explain the tolerance and intolerance of medicines which some neuropathic patients present, and which Huchard has characterized by the happy term, *therapeutic ataxia*. We in fact see our hysterical patients suffer toxic symptoms from minute and almost homœpathic doses of certain medicaments, and bear without injury very large doses of other extremely powerful medicines. But let us return to paraldehyde, and consider the uses which may be made of this medicinal agent.

Paraldehyde, compared with chloral, has these advantages over the latter: it is less irritating, and for this reason it is better tolerated by the stomach and pharynx; it is not a cardiac poison, and, moreover, it works better than chloral in strychnine-poisoning, but it is less analgesic than chloral—that is to say, it calms pain less; therefore, whenever the insomnia is caused by pain, paraldehyde will show itself inferior to chloral, and especially to morphine. On the other hand, in nervous insomnias, and especially in those produced by the abuse of alcohol, paraldehyde is much superior to chloral, and I have many times seen in my hospital service the great benefit which may be derived from paraldehyde in the disorders arising from inebriety.

Much use has been made of paraldehyde in the various forms of mental alienation. In France it is Dr. Kéraval and Dr. Nerkam who have made the greatest number of trials with it in maniacal diseases. They have shown that paraldehyde is an excellent hypnotic in certain forms of insomnia with restlessness, and which are so common in the course of cerebral affections. They have also noted good effects in the convulsive neuroses, and in particular in the epileptic crises and multiple manifestations of hysteria.* I will add that in many cases of morphiomania I have been

*Kéraval et Nerkam, Action hypnotique et sédative de la paraldéhyde dans les différentes formes d'aliénation mentale (Soc. médico-psychol., Mai, 1884); Nerkam, Thèse de Paris, 1884.

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able to replace the morphine injections to which the patients were habituated by paraldehyde in the dose of 3 or 4 grammes (45 to 60 grs.) a day.

It has been affirmed that chloral is superior to paraldehyde in the fact that the latter drug sooner loses its effect on patients than the former drug. My observations do not bear out this view, and I have seen patients who for months have always obtained the same effects from the same doses. I might cite, for instance, the case of a Mexican affected with chronic icterus, who has for more than a year been relying on a 3-gramme dose of paraldehyde to get his sleep at night, and who never has been obliged to increase the dose; and it is the only agent which we have found capable of safely combating the tormenting itching which deprives him of sleep, all other hypnotics having failed in consequence of determining ill effects on the part of the liver or stomach. I think, then, that paraldehyde does not lose its remedial power as soon as has been represented, and among the hypnotics it is one of those that may be the longest continued with the least inconvenience. Paraldehyde seems, then, to me to be especially indicated in strychnine-poisoning, and I believe it perfectly applicable to the treatment of eclampsia.

URETHAN.—Urethan, as you see, presents itself under the form of white transparent crystals, having a fresh savor, resembling that of acetate of potash; it is soluble in alcohol, ether, and water. Its chemical composition is quite complex; it is considered as a carbamate of ethyl. Carbamic acid is a hypothetical acid which has not yet been isolated, and which has a remblance to urea, whence the name urethan, given to the ethyl compound, of which the chemical formula is $C^3 H^7 NO^2$.

Urethan was introduced into therapeutics by Schmiedeberg, of Strasburg, and it has been the subject of experimentation by von Jacksch, of Vienna, Riegel, of Giessen, and by Huchard and Eloy in France.

Urethan seems to be little toxic, and we may give to a hare as much as 45 grains (gms. iii) without producing any other effect than a general lethargy. In man it requires 40 to 60 grains to obtain a hypnotic effect.

By reason of its solubility, urethan is easily administered. Huchard's potion, which is a favorite mode of administration, is as follows:

Urethan, ʒ i.
Dill water, ℥ i.
Syrup aurantii cort., ℥ ss.

M.
Sig. One dose, for a sleeping draught.

A solution may be prepared in water, as follows:

Urethan, 1 part.
Water, 5 parts.

M.
Each teaspoonful of this solution represents 15 grains (gm. j) of urethan.

In fourteen patients to whom Huchard gave urethan he obtained sleep in almost every instance in the dose of 45 to 60 grains, and this especially in the insomnia of the tuberculous. In the trials which I have made with urethan in Cochin, I have obtained also good effects, but these have been less constant than in Huchard's patients, and in three cases, instead of inducing sleep, I have seen severe nervousness and restlessness follow the administration of urethan. This medicine, not being toxic, may be given to infants, and in a two months old babe Huchard procured sleep with a dose of three grains.

Although we do not yet know the physiological action of carbamate of ethyl, we can affirm that it is a hypnotic, but it is not an analgesic, and when the insomnia is caused by pain, it is without effect.

Hopeine.—Hopeine comes from hops, which has given us lupulin, so long vaunted as a sedative of the genital organs. There are in commerce two hopeines, the one white, crystalline, which comes from America, and the other, brown, manufactured in France.

[From careful experiments made with the preparation known as "Williamson's hopeine," in the laboratory of Cochin Hospital, it would appear to be a fraudulent admixture of morphia and lupulin. It responds to all the tests for morphia, and its physiological effects are identical with those of this alkaloid. "It is very doubtful," adds Dujardin-Beaumetz, "if there exist in the vegetal kingdom members of two families so widely apart as the ulmaceæ and the papaveraceæ, containing an identical product, morphia. If this should prove to be the case, why not resort to morphia obtained from opium, rather than utilize a preparation so expensive as the hop morphine." He concludes by expressing a conviction that "by a trick of the trade which we cannot too strongly denounce, morphine is being sold under the name of hopeine."

As for the brown hopeine, this is fabricated exclusively in France. It is a brown pulverulent substance having the smell of beer. It does not seem to contain any alkaloid, and is almost completely formed of a resinous substance. It is but little soluble in water, though very soluble in alcohol.

Huchard has given this hopeine to a number of patients, and twelve times out of fifteen he has obtained a calm and tranquil sleep with a dose of ⅓ of a grain. This sleep is free from dreams or nightmare, and is refreshing; no headache or other cerebral disturbance follows. In brief, the sedation obtained by this brown hopeine resembles that produced by lupulin, though the dose is very much less. It is, however, of very uncertain and variable chemical composition, and its effects may be expected proportionately to vary.]

CHAPTER XIV.

ON NEW ANALGESIC MEDICAMENTS.

My last lecture was devoted to medicaments which produce sleep (hypnotics); to-day I propose to speak about analgesics, that is to say, medicinal substances which antagonize pain. I shall dwell more particularly in this lecture on the new analgesics; aconitia, napelline, gelsemium and gelsemin, piscidia erythrina, and finally on the local anæsthetics such as subcutaneous injections of chloroform and pulverizations of chloride of methyl.

The type of analgesic medicaments is morphine, and if opium and its derivatives are considered as hypnotics, it is because they give repose by banishing all painful sensations. I cannot here enter into the subject of subcutaneous injections of morphine, which I have treated at length in my Clinical Therapeutics. What I can assure you, however, is that the older I grow the more chary I become in the use of morphine, for despite the marvellous properties of this alkaloid which is far the most active of analgesics, its dangers and disadvantages are such that I reserve its employment for exceptional cases only.

In fact, the superiority of morphine constitutes one of its most serious evils. Let me explain: Whenever a patient has once made use of morphine, thereafter all other analgesics seem inefficacious and unsatisfactory, and he looks continually to the same medicament for the relief which he has experienced, and when the pain is entirely gone he will have become so accustomed to his morphine that he will with difficulty, if at all, free himself from the habit. This is the history of almost all cases of morphiomania; at the beginning it is for a neuralgia, a mild attack, perhaps, for which the patient has recourse to the injections of morphine, and little by little he becomes habituated to the poison, and when he is once a victim to this vice, it will be very difficult to make effectual opposition to it.

Do not, then, resort to these injections except when you have to do with intense pain caused by cancer or in the last periods of pulmonary diseases; here morphine is really advantageous, enabling us to prolong the life of these unhappy beings and make them tolerably comfortable. In all these cases never allow the patient to make the injections himself, and only resort to them when the pain becomes too severe, and not till you have employed all the other means in your power.

Aconite, after morphine, is one of the most powerful analgesics, and the subject of aconite and aconitia deserves to arrest your attention for a few moments, illustrating, as it does, how complex is the application of medicinal plants to medicine, and how cautious we should be in deducing positive conclusions from any observed sequences in the therapeutic use of these agents.

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For a long time, practitioners in this country made use of preparations from aconite leaves, and the results obtained were very problematical. Oulmont, in showing us that the active principles of the plant vary according to its origin and the parts used, made apparent the cause of the seeming inertness of these aconite preparations, for the leaves contain very little of the active principles, while the roots are largely impregnated with them. Hence it is that in England, where the Pharmacopœia sanctions the usage of the root alone for the officinal preparations, very energetic results have been obtained from these latter. Duquesnel, in extracting from these aconites a definite crystalline principle, added still more to our knowledge of this plant, and his studies, in connection with Laborde, of aconite and aconitia have been of great value.

There exist two great varieties of aconite, the one growing in Europe, the other in Asia; the French aconite may be subdivided into the *aconitum anthora* and the *aconitum pyrenaicum* with yellow flowers, the *aconitum napellus* and *aconitum napellus neomontanum* with blue flowers; the type of the Asiatic aconites is the *aconitum ferox*.

When you analyze these different plants, you find that they contain a crystalline aconitia, an insoluble amorphous aconitia, and another which is soluble, to which Duquesnel has given the name of *napelline*. Moreover, in the Asiatic aconites, there is found another crystalline alkaloid, *pseudo-aconitina*, and an amorphous alkaloid, *amorpous pseudo-aconitina*. Finally, what is still more astonishing, is that according to the origin of the aconites, these alkaloids behave differently with respect to polarized light.

You see before you two solutions of crystallized nitrate of aconitia; the one comes from the *aconitum napellus*, gathered in Dauphiné and deviates the polarized ray to the left by 3°.4; the other is obtained from a plant growing in Switzerland, and is also lævogyrus, but by 4°.8.

You see how complex is this question of the aconitias, and how different must be the result according to the plant employed. There exist in commerce English and German aconitias, an aconitia of Morson, another of Duquesnel, etc., and all these aconitias have variable therapeutic and physiological actions, for the reason that they are derived from plants of different origin. It will then be absolutely necessary, when you wish to prescribe aconite or aconitia, to specify the part of the plant and its place of origin, if you write for aconite, and the laboratory where it was extracted, if you order aconitia.

We actually make use almost exclusively of the alcoholic tincture of aconite root, and we add the name of the province, whether of Vosges or Dauphiné. Duquesnel thinks that the tincture is preferable, and he proposes the two following preparations: the tincture of aconite root, and the extract; the latter being the most active, three to four centigrammes of the extract representing one gramme of the tincture. As for aconitia, it is the crystallized nitrate of aconitia, which you should order, adding the name of Duquesnel, and under the form of granules containing a quarter of a milligramme of the active principle. (In American pharmacy a pill is in use containing 1-200 grain crystallized aconitia).

As for the doses, they are exceedingly variable, and you should always remember that certain persons have a real intolerance of this medicament. I have for my part seen toxic phenomena of great gravity determined by extremely minute doses of crystallized aconitia, scarcely the 1-120 of a grain.

Therefore you will have care that the doses shall be wide apart when you make use of this alkaloid, and order, for instance, a granule of a quarter of a milligramme (1-240 grain) every six hours, giving directions not to exceed four granules in the twenty-four hours. It will even be necessary to stop the medicine when the patient experiences the first toxic symptoms, such as tingling of the tip of the tongue, and that strange sensation of loss of elasticity of the muscular orifices of the mouth, eyes and nose, when it seems to the patient that the skin of the face is shrunken.

If you make use of the tincture or fluid extract of the root, the dangers of poisoning are less, and you can give ten and even twenty drops three, or even four times in the twenty-four hours. The dose of the extract is one-sixth of a grain, which you can repeat once or twice during the day.

Aconite and aconitina have a very limited sphere of action, which as far as pain is concerned, is confined almost exclusively to the trifacial nerve; its action on the other sensory nerves is much less marked.

By the side of this analgesic effect, aconite has a special action on the circulation; it is an anticongestive vascular medicament from which you may obtain good results, especially in the pulmonary congestions accompanied with cough, of which one of the types is influenza. You know that in this affection I have been in the habit of ordering the following mixture:

Into a glass of warm milk put two tablespoonfuls of syrup of tolu, a dessert-spoonful of distilled cherry-laurel water, ten drops of tincture aconite root, and order the whole to be taken in one dose and repeated three times a day.

Aconitia, as I have told you, has a special influence on the trigeminus, abolishing conscious and painful sensibility, and acting also on the unconscious or reflex sensibility; it modifies the blood pressure, diminishing arterial tension, and lowering the temperature. These are especially the physiological effects which are utilized in therapeutics.

Aconitia has besides another effect of which I must remind you, for it has given rise to several mistakes. I refer to its action on the pupil. Administered internally, aconitia dilates the pupil, and this explains why physicians, seeing this mydriasis, have sometimes thought that the apothecary had made a mistake, and instead of granules of aconitia had given granules of atropine; you will not then be led astray if you should see pupillary dilatation follow the use of this alkaloid.

It is in facial neuralgia that aconitia produces its maximum of therapeutic effects, and for my part, I am acquainted with few neuralgias which are not relieved by this means. When the prosopalgia presents itself under intermittent form, you will do well to associate quinine with the aconitia. You can unite in the same capsule five grains of quinine with one two-hundredth of a grain of crystallized aconitia, or having administered a capsule containing the five grains of quinine, you can give one of Duquesnel's granules, and repeat the dose every six hours until the pain has entirely disappeared.

Aconitia is not, as I have told you, the only active principle obtained from aconitum napellus. There are also found two amorphous principles, the one soluble, the other insoluble. It is to the first of these principles that Duquesnel has given the name of napelline. Thanks to its solubility, napelline may be given subcutaneously. Laborde and Daudin have experimented with napelline, and have shown that this alkaloid is much less active than crystallized aconitia, and that, moreover, instead of being purely analgesic, this napelline possesses quite marked hypnotic properties. They have also employed this alkaloid in subcutaneous injections in the dose of five-sixths of a grain once in the twenty-four hours, and have never seen toxic symptoms follow. Hence they think that napelline, by its less intense toxic action which renders it more manageable, is a medicament which may be employed to advantage in the treatment of neuralgias.

If you wish to repeat these trials, I advise you to adopt the following method: Make subcutaneous injections of a solution of one-sixth of a grain of napelline in a cubic centimeter of water, repeat these injections three or four times in the twenty-four hours. Grognot, of Milly, has employed napelline in granules of two and a half milligrammes (one twenty-fourth of a grain), and in the dose of three centigrammes (one-half grain), he cured a rebellious facial neuralgia which had resisted the action of crystallized nitrate of aconitia. But I have no more time to spend on aconite and its alkaloids, and pass to the study of gelsemium.

Gelsemium sempervirens, or Virginian jasmine, has been employed largely by the Americans. It is a climbing plant, with yellow flowers, which grows in the moist soil of Virginia and other of the Southern States. The roots and the stem are employed in medicine; of these a tincture is made, which is given in the dose of ten drops every two hours in facial neuralgias, being especially remedial in dental neuralgia.

Remarkable results have been claimed, notably in the intermittent forms of neuralgia.

I experimented with gelsemium several years ago (in 1877), and my pupil, Dr. Eymeri, has given in his thesis the results which we obtained.* These results were similar to those of previous experimenters who had studied the therapeutic, toxic, and physiological action of this plant. We found that gelsemium is an energetic poison, and that its toxic action is variable, according to the preparation employed, so that one tincture made with the stem may give small or unappreciable effects, while another, made with the root, may have a marked toxic action in the same dose. I have myself seen a patient who experienced severe symptoms of poisoning from thirty drops of the tincture; moreover, quite a number of fatal cases have been recorded from the use of this drug, so that while recognizing the analgesic action of the preparations of gelsemium (inferior though this be to that of aconite and its alkaloids) it has seemed to me to be wisest, owing to the acknowledged uncertainty of the gelsemium preparations, to be very chary in the use of this remedy.

It has been recommended to employ, instead of gelsemium, the alkaloid gelsemin, discovered by Fredidge, but we know little respecting the action of

* Eymeri, on Gelsemium sempervirens (Thèse de Paris 1877).

this active principle, and we ought to be well established with regard to its physiological and toxic effects before giving it a place in therapeutics. Moreover, gelsemium and its alkaloids produce not only paralysis of sensibility, but also of motility, and, as Rouch has well shown, gelsemium is especially a poison of the motor-nervous system. Moreover, Rouch has also pointed out in his experimental researches, as we have also done in our clinical observations, that the effects vary according to the preparation employed.

Piscidia erythrina, or Jamaica Dogwood, is of quite recent introduction into therapeutics. The first experiments made with it, by Ott*, of Philadelphia, and Nagle, in 1881, show it to be narcotic to animals; it is, however, worthy of note that in 1844, Hamilton of Plymouth pointed out the analgesic properties of piscidia, and Ford, in 1880, recommended it in neuralgias. Since the labors of Ott and of Nagle, there have been numerous trials with piscidia, and Firth, James Scott, and MacGrotz, Seifert of Berlin, and Vanlair of Liège, have published observations on the therapeutic effects of this remedy.

It was Landowski, in 1883, who was the first in France to call attention to the narcotic and analgesic properties of piscidia. Huchard has utilized it in combination with viburnum prunifolium, and I have

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* Ott, on the Physiological Action of the Active Principle of Piscidia Erythrina (Arch. of Med. 1881).

myself made in this hospital, and in my laboratory, a great many therapeutic and experimental researches on this subject in connection with my pupil, Dr. Legoy, of Houilles.*

Piscidia erythrina is a shrub or tree of the family Leguminosæ, which grows in South America and the West India Islands. Its name comes from the brilliant color of its red flowers, and the stupifying action of its bark on fishes, an action which is very similar to that of cocculus indicus. In America, this plant is designated under the name of Jamaica dogwood. It is the bark of the root which is used exclusively, and according to the researches of my pupil Carette, there are found in this bark the following ingredients: a resin, a terebenthinate substance, starch, a salt of ammonia, and finally an alkaloid which Bruel and Tanret have extracted. But here the same difficulties have been met with as in the case of gelsemium, the alkaloid being found in roots of one source and not in those of another, and the therapeutic results being variable and uncertain in consequence.

Besides this different composition resulting from the different sources of this dogwood bark, there is another fact which obscures its physiological action. I refer to its unlike effects on warm-blooded and on

* Hamilton, Pharmaceutical Journal and Transactions, 1884; Ford, Therapeutic Gazette; Legoy, Du Piscidia Erythrina (Bull. de thér., 1885, t. cviii, p. 72, et Thése inaug., 1884).

[redacted]

cold-blooded animals. While in the case of the former the physiological action, even in large doses, is almost nil, in the second, on the contrary, it is very marked. When piscidia is administered to a frog, there are observed convulsive movements, an exaggeration of the frequency of respiration and of the cardiac pulsations, a tetanoid state, and finally death. Piscidia seems to act almost exclusively on the gray elements of the bulbus and medullary centre; it acts also on the ganglionic nervous system.

It is under the form of the powder, or fluid extract, or tincture, that piscidia is administered; the latter seems to us to be preferable. I would recommend the following formulæ:

℞ Fluid extract jamaica dogwood, ʒ ss.
Syrup aurantii corticis, ℥ viii.
M.
Liq. Take a tablespoonful *pro re nata.*

The tincture may be given in doses of from 40 to 50 drops. Huchard associated piscidia with viburnum in the following manner:

Take of

Alcoholic tincture of jamaica dogwood.
Tinct. (or fluid ext.) viburnii prunifolii, aa gtt L.
M.
To be taken for one dose *pro re nata.*

Thus far the majority of physicians who have given their attention to piscidia consider it as hypnotic.

The therapeutic applications which I have made with this drug do not permit me to share this view, and I regard piscidia as an analgesic very similar in its action to gelsemium, causing sleep because it relieves pain.

Moreover, the first trials made by Hamilton with piscidia (in 1884) were confirmatory of this view. Hamilton was suffering from an intolerable t othache; he applied to the gums, in the vicinity of the tooth, a pledget of cotton wet in tincture of piscidia; the relief was instant and complete. He then bethought himself to apply the same remedy internally for obstinate pain; a marked anodyne effect was realized, with profound sleep. In several cases of rebellious facial and brachial neuralgia, we have seen the pain disappear as by magic under teaspoonful doses of fluid extract of Jamaica dogwood, but like gelsemium it is an untrustworthy analgesic, and this in consequence of reasons above given. So when you prescribe piscidia, you will do well to specify the Jamaica dogwood, this being the only reliable kind. The dose of the tincture is from 30 drops to a fluid drachm; the American fluid extracts are much in use and are given in the same dose. Syrup is a good vehicle for administration.

I shall finish this lecture by a brief consideration of two local means which have of late been used to assuage pain; I refer to subcutaneous injections of chloroform and to the chloride of methyl spray.

Subcutaneous injections of chloroform were first prescribed by Dr. Roberts Bartholow about ten years ago,* but their employment in France is of much more recent date. It was in 1877 that Ernest Besnier made known the good effects which he had derived from these analgesic injections, and the following year one of my pupils, Dr. Fournier, recorded in his thesis the results of the trials which I have made with the same remedy in my service at the hôpital St. Antoine. In these experimental investigations I found that if in man the dose of chloroform injected under the skin be raised to about two and a half drachms, sleep is produced, but without anæsthesia.

I have given in elucidation of this fact an explanation which Claude Bernard had already invoked in his studies on anæsthetics. I have shown that in introducing chloroform under the skin, this medicament, before reaching the cerebro-spinal axis, where it produces its elective action, traverses the lungs, where by reason of its extreme volatility, it escapes with the air of expiration, and that the quantity which remains in the blood is too insignificant to make a very powerful impression on the nervous elements of the cerebro-spinal axis; at each inspiration, however, the patient drawing back a certain quantity of air thus charged with chloroform, obtains in this way sufficient of the

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* Roberts Bartholow, On the Deep Injections of Chloroform for the Relief of Pain. Practitioner, July, 1874.

anæsthetic to produce sleep and an anodyne action, but not profound insensibility.*

Professor Bouchard has repeated these experiments from another point of view which had absolutely escaped me. All the animals, and particularly the hares, under whose skin he injected chloroform, succumbed with albuminuria;† the explanation of this fact has not yet been found.

Despite their undoubted analgesic action, hypodermic injections of chloroform have not found favor, and I am inclined to attribute the abandonment of them by the profession to the local inflammatory symptoms which result from these injections when carelessly or improperly made. When you desire to make use of these injections of chloroform do not forget that it is important to make them penetrate deeply. I advise you, then, to plunge the needle of your syringe perpendicularly, its whole length, into the fleshy parts and there throw your injection. This, moreover, is the way that we generally make our hypodermic injections at the present day; formerly it was the custom to pinch up a fold of skin and enter the needle obliquely parallel to the fold and introduce the solution into the cellular tissue; the former method is certainly most rapid and advantageous.

* Clinical Therapeutics. Am. ed. G. S. Davis. Page 12.

† Bouchard, On Albuminuria determined by Subcutaneous Injections of Chloroform. (Acad. de Med., 1884).

It is well understood that these subcutaneous injections of chloroform ought to be made in *loco dolenti;* for this reason their application is rather limited through fear of eschars and abscesses. Hence it is especially in sciatica and lumbago, or even intercostal neuralgia, in all cases, in short, where the cellular tissue permits the deep introduction of the medicament, that these injections should be practised. The quantity ordinarily injected is one cubic centimetre, or about twenty drops, but you may go even farther, and inject at short intervals as much as two or three fluid drachms.

The application of chloride of methyl is of quite recent date, and it was last year (in 1884), that Débove made known to us the good results which he had obtained from external applications of this chemical to the treatment of neuralgia.

Chloride of methyl, which is also called muriated methyllic ether, is, at the normal temperature, a colorless gas, with sweetish odor and taste. It may be liquefied by cold or by pressure; it is under pressure that it is utilized in the cases of which I am about to speak When liquefied, methyl chloride is a colorless liquid which boils at the temperature of 23° C. Hence it is that it evaporates immediately when brought into contact with the air, and that by this molecular change an intense cold is produced, amounting to a fall of 40° or even more.

Formerly these refrigerant properties were only employed (as by Malassez) to freeze histological specimens. This easy transformation into gas of liquefied chloride of methyl, necessitates keeping this liquid in very strong recipients. We thought first of all of using the syphon bottles, so much employed for dispensing soda water, but we had to give them up, on account of the bursting of the bottles under the influence of an elevated temperature. To obviate dangers of this kind, we have had to resort to flask-shaped metallic reservoirs, which are rather complicated and rather costly, and this is, it must be confessed, one of the circumstances militating against the general use of this remedy. Nevertheless, now that you can hire these bottles at a reasonable cost, everybody may now avail himself of the benefits of this treatment, as the most of our instrument makers, and even the pharmacists, have this apparatus to let.*

The apparatus which I here show you (see Fig. 7) was made by Galante, and it is one on which you can rely. It consists, as you see, of a metallic bottle, which at its superior extremity has two openings closed by screw caps. By means of the wrench C you remove the screw cap B, and you replace it by another screw cap E, to which is fixed a metallic tube terminated by a filiform opening, by which the chlor-

*Unfortunately this apparatus, which is expensive, has not yet been introduced into this country. See H. B. Millard's article in the Therapeutic Gazette, February, 1886.—TRANS.

FIG. 7.

ide of methyl escapes. Then, still with the same wrench, you remove the screw cap A, and you place the central part of the wrench upon a metallic nut situated in M and which holds the wrench horizontal ly; and it will be sufficient for you to turn a little, by means of this wrench, the screw faucet with which it is connected, to cause the chloride of methyl to escape by the filiform opening which I have pointed out to you. The management of the instrument is then very easy, and all you will have to do will be to pass for a few seconds over the painful points the chloride of methyl spray.

The surface of the skin which is thus touched by the methyl chloride spray becomes congealed, pale and hard, and the patient experiences a sensation of smarting and burning provoked by the intense cold which is produced. If the topical effect is too prolonged, a local mortification ensues, which consists in simple vesication or in veritable eschars. Ordinarily, and when the action of cold has been of short duration, the skin turns red and then it assumes on the following days a brownish tint which it may keep for some time.

Hence I cannot too strongly urge you not to prolong the action of the chloride of methyl, and never to let the spraying exceed four or five seconds on the same part of the skin. For the production of vesication and of eschars adds nothing to the therapeutic effect which one desires to attain. When you wish to apply the spray over hairy regions, you must first shave the skin. The therapeutic action of these pulverizations of methyl chloride is exceedingly interesting, and if we may judge by the facts reported by Débove, and several others of our hospital colleagues, and in particular by Dr. Tenneson, brilliant cures in obstinate neuralgias have resulted from this treatment. You may also have seen in our hospital service the great benefits which we are deriving from this method, and when, in rebellious sciaticas, our vesicatories and punctiform cauterizations fail to relieve, we resort to the methyl chloride spray. If it be a case of real sciatica, the pain generally ceases after one or two applications of chloride of methyl. It is not so when we have to do with sciatic pains resulting from affections of the spinal cord, or compression of the nerves; here the method generally fails; yet in certain cases of sympathetic neuralgia (determined for instance by cancer of the womb) Desnos has had success.

Clinicians have even gone farther, and have applied the methyl chloride to the relief of the phenomenon pain, from whatever source arising; in this way Tenneson has caused to disappear the pains in the side attending acute or chronic pulmonary affections. I think that this is extending the analgesic action of chloride of methyl farther than we are warranted in doing, and that it will be better to reserve it for very rebellious neuralgias. The therapeutic application, then, of chloride of methyl spray is one of the really useful discoveries of the day, and you will do well always to resort to this treatment (which is in itself not at all dangerous) whenever you have to deal with stubborn neuralgia.

In the next lecture I shall take up the new local anæsthetics.

APPENDIX TO CHAPTER XIV.

TONGA.

A compound fluid extract, prepared from the root of Raphidophora vitiensis (natural order Araceæ) and the bark of Premna taitensis (natural order, Verbenaceæ), both plants indigenous to the Fiji Islands.

Preparations.—Fluid extract; dose, 30 minims to 1 fluidrachm (2 to 4 C. c.).
Powdered extract; dose, 6 to 12 grains.

Properties.—This agent has long been employed by the natives of the Fiji Islands as a remedy for neuralgia. A supply of the crude drug was carried to England by a gentleman residing temporarily in Fiji, and placed in the hands of a retail drug house London. It was then tested therapeutically by Drs. Ringer and Murrell, and the results published in the London Lancet, March 6, 1880, pp, 360, 361, March 30, 1880, p. 445, and in the London Pharmaceutical Journal and Transactions, April, 1880. The scientific work of these investigators created a demand for the drug in this country, which has been met by the enterprise of Parke, Davis & Co. The result of the experiments of Drs. Ringer and Murrell, corroborated by the trials of many practitioners in this country, demonstrate conclusively the great value of this remedy in neuralgic affections, especially in those of the cranial nerves.

GUARANA.

Paullinia sorbilis; Synonyms, Brazilian cocoa, pasta guarana; part employed, a preparation made from the seeds; natural order, Sapindaceæ; Habitat, Brazil.

Preparation.—Fluid extract of a preparation of the seeds, U. S. P.; dose, 5 to 30 minims (0.3 to 2 C. c.).

Properties.—The physiological effects of Paullinia are due to its alkaloid, chiefly; and, as this is identical with caffein, the therapeutic indications for the remedy are the same as those for caffein. The special use of Paullinia is in the treatment of sick headache or migraine. It is adapted to the so-called nervous form of sick headache, and is less efficient when the attacks are due to stomachal troubles. From its astringency the remedy is useful also in chronic diarrhœas, particularly in the diarrhœa of phthisis.

The following combination of guarana, caffein and carbonate of ammonia is one of the most efficient remedies in migraine ever prescribed:

℞ Cit. caffein.
Carb. ammon. āā ʒ i.
Elix. guarana ℥ i.

M.
Sig. A teaspoonful when required.

—G. M. Beard.

CHAPTER XV.

ON LOCAL ANÆSTHETICS.

GENTLEMEN: In the present lecture I propose to consider the new anæsthetics, and omitting altogether surgical anæsthesia in its various bearings and uses, which would require a whole course of lectures, I shall take up only one of the minor aspects of the question, and discuss the subject of local anæsthesia, which presents no little interest at the present day.

For a long time clinicians have sought to diminish or abolish the sensibility of the skin in regions where the minor surgical operations, such as simple incisions of the skin and cellular tissue, were to be performed. This was considered the more desirable, inasmuch as grave accidents sometimes attended the first attempts at general anæsthesia. One of the means most employed was cold.

It was, in fact, known that when cold strikes the exposed parts of the body it produces numbness and insensibility, and practitioners had recourse not only to local applications of ice, but also to refrigerant mixtures. Hence it is that James Arnott, of Brighton, many years ago, advised the combination of ice and common salt, and Adolph Richard, that of sal-ammoniac, salt and ice.

One may also obtain this local anæsthesia by the rapid evaporation of volatile substances, such as ether, and Simpson was one of the first to counsel this mode of refrigeration. I remember to have seen, thirty years ago, at the commencement of my medical studies, a very ingenious apparatus, made according to the plan of Prof. Richet, which consisted of a pair of bellows over which was placed a reservoir of ether; as fast as the stream of ether was projected on the exposed surface of the skin, it was volatilized by the blast from the bellows. This apparatus which was rather cumbersome, was advantageously replaced by Richardson's spray producer, of which we make use at the present day.

The atomization of ether as a process of local anæsthesia possesses great advantages over the local application of ice or refrigerant mixtures; nevertheless, these sprays are not free from the other inconveniences of refrigeration. Cold does, in fact, abolish sensibility, but during the application of the cold the pain is quite keen and when the anæsthesia has disappeared, the pain returns more pungent than before, so that if one suffers but little during the operation, the after effect is quite painful; moreover, the reaction is sometimes followed by profuse hemorrhage. These are disadvantages which limit the usefulness of local anæsthesia by cold.

Other liquid substances have been substituted for ether, such as rhigolene, by Bigelow, of Boston, and Delcomenete, of Nancy, a few years ago, advised carbon bisulphide as a means of local anæsthesia. I have myself been much interested in this subject of the local uses of bisulphide of carbon. This chemical, by reason of its extreme volatility, produces refrigeration of the tissues, but this refrigeration is rapidly followed by such intense rubefaction, that carbon bisulphide ought rather to be considered a rubefacient of the first order, superior in many respects to mustard sinapisms, than as a local anæsthetic. It has also been proposed to employ certain gases for the production of local anæsthesia, and it is for this purpose that carbonic acid was recommended as early as 1772 by Percival. In 1856 Simpson again took up this means of local anæsthesia, improving the apparatus for its production, and it was then quite a common thing to see local douches of carbonic acid used in the hospitals of Paris, though rather for analgesic than for anæsthetic purposes; they were used chiefly to relieve the pains caused by cancer of the uterus. We have even seen this gas employed in the treatment of neuralgias at the thermal stations, where are found waters highly charged with carbonic acid, as at St. Nectaire. Finally, in 1883, my friend, Dr. Campardon, following the ancient practice of Percival and Simpson, applied carbonic acid to the treatment of whooping-cough.

Thanks to the acknowledged anæsthetic properties of carbonic acid, it abolishes the exaggerated sensibility of the glottis, and thereby lessen the fits of coughing in pertussoid patients. The means employed by Campardon is very simple; it consists in utilizing the well-known soda-water syphon bottles—the bottles which are in use for this purpose are destitute of tubes dipping into the liquid, and only the liberated gas issues from the mouth of the bottle. A rubber tube adapted to the syphon, and which the patient takes between his lips, conveys the gas into his mouth; the child makes a few inspirations, and Dr. Campardon affirms that by this means he has seen the paroxysms rapidly diminished But I come now to a mode of local anæsthesia of much more recent date, and which is destined to render us great service; I refer to coca and cocaine.

From time immemorial, the Peruvians have made use of the leaves of a shrub belonging to a family of Erythroxylaceæ, the *Erythroxylon coca.* In their estimation, this leaf has multiple remedial properties, and, according to the statement of Dr. Beugnier-Corbeau, "the sacred plant or the Incas was a promise of life to the moribund who could drink its sap; an incomparable viaticum to the traveller whose hunger it appeased; a cordial to raise the forces and revive the senses benumbed by the cold of the rugged winter; a source of sweet forgetfulness to the man harassed by chagrin; and a joy-producer to him who would taste the pleasures of love."

When, twenty years ago, or a little more, it was proposed to introduce coca into therapeutics, it was chiefly its tonic and excitant properties which were vaunted; and you will find in the thesis of Damarle, and in the writings of Reis, indications relative only to these tonic properties.* However, in 1860, Niemann had discovered in the leaves of coca a crystalline alkaloid having for its formula $C_{17}H_{21}NO_4$, to which he gave the name of cocaine; and, two years afterwards, Wolher and Lossen found another active principle, of syrupy consistence, having a very marked ammoniacal odor to which they gave the name hygrine.

These chemical discoveries added nothing to our knowledge of coca till Koller made known, on the 16th of October, 1884, to the Medical Society of Vienna, the marvellous anæsthetic action of cocaine on the mucous membrane of the eye. You remember how great was the astonishment, and what incredulity was manifested; but soon the facts which Koller had announced were confirmed all over Europe. Abadie and Darier, Trousseau, Panas, and all the ophthalmologists showed the great advantages which might be obtained in ocular therapeutics from the discovery of Koller, and the anæsthetic properties of cocaine were henceforth everywhere recognized. By what train of ideas was Koller led to make this grand discovery, which constitutes an epoch in the therapeutic history of this country? And how is it that coca, from being the tonic and waste-restraining medicament

* Damarle, on Coca, Thèse du doctorat, 1862. Reis, on the Use of Coca, Bull. de Thér., 1866.

which it once was, has been transformed into a local anæsthetic? The history is so strange that you will allow me here briefly to relate the points of interest.

Moreno y Maiz,* in his thesis of 1868, on cocaine (which, by the way, was the first that was ever written on this alkaloid), made mention of the following fact: "In large doses, cocaine produces in animals diminution, then annihilation, of sensibility, without motility being completely abolished; in all cases the pupil remains dilated."

In 1870, Gazeaux gave expression to certain doubts respecting the tonic and waste-restraining properties of coca, and thought that this medicament might act by allaying the sense of hunger and thirst through its anæsthetic effect on the lingual and gastric mucous membranes.

In fact, physicians who were engaged in treating affections of the larynx had noticed this special anæsthetic action of coca; and Fauvel, since 1869, was in the habit of using coca in laryngeal diseases.

In 1877, Saglia insisted anew on the advantages to be derived from the sacred plant of Peru in painful affections of the pharynx, and this anæsthetic action was so well shown that, in 1881, Du Cazal,† at the

* Moreno y Maiz on Cocaine, Thèse de Paris, 1868.

† Saglia, on Coca: its Therapeutic Applications, Gaz. des Hôpitaux, May, 1887. Du Cazal, Compt. Rend. de la Soc., 1881, p. 283.

Medical Society of the Hospitals, thus expressed himself *à propos* of a case of tuberculous ulceration of the larynx presented by our colleague, Millard: "The tincture of coca is an excellent medicament with which to obtain anæsthesia of the pharynx, and to produce such anæsthesia it is only necessary to paint the mucous membrane with the tincture." Gougenheim,* in 1882, when writing of the local treatment of the laryngites, said: "The extract of coca, diluted in water, so as to form a very concentrated solution, produces a veritable sedation; I do not know the cause of this therapeutic action."

Moreover, the physiologists, on their part, did not remain inactive, and, in 1880, Von Anrep spoke of the pupillary dilatation, but had not observed the state of the mucous membranes. The following year, Coupard and Laborde noticed the anæsthetic action of cocaine. Unfortunately their experiments remain incomplete, and the results have not been published.

Hence, then, gentlemen, as you see, what led Koller to his discovery was the knowledge of the local anæsthetizing properties of coca on the lingual and pharyngeal mucous membrane; he thought, and rightly, that all the mucous membranes must respond alike to the action of this medicament; and since then we have been able to add that even the skin submits to this

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* Gougenheim, on Local Treatment of the Laryngites, Soc. de Thér., 1882.

anæsthetic action. It is unfortunate that the discovery of the local anæsthetic properties of cocaine was not followed up in France, where there had been so many investigations on this subject, and where, fifteen years before, the anæsthetic action of coca on the pharyngeal mucous membrane had been pointed out.

When you put in contact with a mucous surface a two-per-cent. solution of hydrochlorate of cocaine, you obtain, at the end of from five to ten minutes, loss of sensibility of the mucous membrane, and this effect lasts an hour or two. The anæsthetic action does not seem to exhaust itself by habit—that is to say, a second and third or any future application is as successful as the first. The same insensibility is produced when the cocaine is introduced under the skin, and in the experiments made under our direction by Dr. Paul Compain, and which you will find described in his inaugural thesis,* I studied thoroughly the anæsthetic action of hypodermic injections of this alkaloid.

You see before you a patient on whom we are about to experiment; we pinch up a fold of the skin of the forearm and inject twenty drops of a two-per-cent. cocaine solution. This injection, as you may see, does not cause any painful sensation. If in the course of five minutes, we explore the sensibility of the skin over the point of injection, this is what we shall

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* Paul Compain, Contribution to the study of hypodermic injections of hydrochlorate of cocaine, Thèse de Paris, 1885.

observe: the sense of touch is obtunded, and the patient tells us that he feels as if the skin over that place were covered with a thick layer of wadding. The consciousness of painful impressions is abolished, and we may with impunity scratch or prick the part with a needle; the patient has over this region only the sensation of contact of a foreign body. The anæsthetic state of the skin is produced in only a very limited zone, which exactly corresponds with the portions of the derm which have been directly in contact with the solution of cocaine, and in our patient it represents a circular space of about an inch and a half in diameter. This complete anæsthesia of the skin lasts about twenty minutes, then disappears little by little, and an hour after there remains but a trace of the anæsthetic phenomena.

May these hypodermic injections be accompanied by general symptoms? Yes, in certain cases. In the first researches which were made in our laboratory by Drs. Bardet and Meyer, these experimenters affirmed that they had felt such general effects as, first, a marked dilatation of the pupil coming on half an hour after the injection, then syncopal symptoms, so intense that one of them completely lost consciousness and fell on the floor—his face was pale and his pulse imperceptible; these symptoms returned whenever he assumed the erect posture.

Since then we have observed the same symptoms in a number of our patients. One of these was a woman on whom we wished to practice forcible dilatation of the anus; we injected around the margin of the orifice a syringeful of a two per cent. solution; there supervened syncope, nausea, and curious twitchings of the alæ nasi.

I was recently consultant in a case in which I had ordered subcutaneous injections of cocaine to combat a vehement intercostal neuralgia. The attending physician wished to experiment on himself with the same injection, after having administered it to the patient. In both of them there were very pronounced symptoms. The physician experienced an attack of syncope, while the patient had very strange sensations; he felt, he said, extraordinarily light, and he seemed to himself to be lifted up into the air like a balloon.

In these cases the injections were practised with a two per cent. solution, and the dose did not exceed from one to two centimetres. I must add, that in all these instances the patients were standing or sitting, which postures would be likely to favor syncopal attacks. Hence it is that, since I have taken the precaution to make the patient lie down whenever I have administered the cocaine injection, these phenomena have not occurred.

To what causes must we ascribe these effects? Probably to the cerebral anæmia produced by the action of cocaine upon the vasomotor nerves; in fact, besides the considerable part which the dorsal position plays in the appearance or non-appearance of the general effects of cocaine, it is noteworthy that these general symptoms are the more likely to supervene, the more anæmic the patient is, and that they are inconspicuous when the patient is strong and vigorous. Hence it is that Dr. Compain has never seen such accidents produced as the results of numerous injections which he has made on himself. Moreover, when experiments are performed with cocaine on animals, and particularly on the monkey, such as Prof. Grasset and Dr. Henri Negre have made, there appear convulsive phenomena characterized by attacks of clonic spasm, and this happens when the dose is reached of six cubic centimetres of a two per cent. solution.

Moreover, cocaine has an evident action on the temperature, which it raises; it is, therefore, a hyperthermic agent. This action, however, is very variable, according to the kind of animal experimented on; for, while cocaine raises the temperature in the dog, it lowers it in the monkey. In fine, my pupil Dr. Rigolet has noted *de visu* the modifications effected in the capillary system by the action of the cocaine. Several drops of a one per cent. solution determine in the frog, at first a dilatation, then a contraction of the capillaries; and Rigolet considers this alkaloid a powerful vaso-constrictor. These experiments give us a physiological explanation of the general symptoms which in man are determined by cocaine.

However, thus far these accidents of a toxic kind have never presented any gravity, and to determine such constitutional effects it is necessary to employ pretty large doses. Thus, Rigolet has been able to inject, without any harm, 40 centigrammes in the veins of a dog weighing 18 kilogrammes. Likewise, Bignon of Lima has observed that the Indians can absorb as much as 40 centigrammes of cocaine in chewing the leaves, without experiencing any toxic manifestations.

Ordinarily, to obtain the anæsthetic effects, we make use of a two per cent. solution of chlorhydrate of cocaine. According to the researches which I have made, the increase of the anæsthesia is not proportioned to the increase of dose, so that we may adhere to this two per cent. solution with the certainty of experiencing the desired results.

In certain cases we may employ pomades of cocaine, and in the preparation of these it is not necessary to transform the cocaine into a hydrochlorate. Bignon of Lima has, in fact, shown us that the alkaloids of coca are soluble in unctuous substances of mineral origin, such as vaseline; the dose here is the same as in the case of the solutions; finally, one can have recourse to preparations made from the plant itself. Delpech, in particular, has made an extract of coca according to the method of the American Pharmacopœia—that is, by evaporating the alcohol, and which is said to render good service in affections of the pharynx.

Before undertaking the consideration of the action of coca and its therapeutic applications, I desire to say a few words about its cost.

When Koller's discovery was first made known, cocaine readily brought a very high price, and this was the first drawback to its general use. I have, in fact, known physicians, ignorant of this high cost, to prescrbe gargles, lavements, and ointments, the price of which exceeded twenty dollars. To-day cocaine is sold at a much cheaper rate, and you can find in our drug stores cocaine of impure quality, though still pure enough for all anæsthetic purposes, save in ophthalmic surgery, the price of which varies from four to six francs a gram.

THERAPEUTIC APPLICATIONS OF COCAINE.

Cocaine is, as we have seen, a local anæsthetic of the mucous membrane and the skin. To begin with the subject of the production of cutaneous anæsthesia, it is necessary, in order that the cocaine may act, that it be applied to an abraded surface, or introduced under the skin. I have never obtained the least effect from the prolonged contact of cocaine with the undenuded skin, whether the alkaloid were rubbed over the derm in the form of concentrated solutions, or in the form of ointment.

When the skin is deprived of its cuticle, and cocaine is applied, the latter has a very marked anæsthetic action, and you can derive advantage from this property in the treatment of *burns*, where solutions or pomades of this alkaloid at once dissipate the pain which accompanies burns in the first and second degrees. You will obtain the same analgesic effects in the case of cracked nipples, so common in nursing women, and Audhoui has reported interesting instances of this kind. In certain pruriginous affections of the skin, moreover, cocaine may be used to allay the tormenting itching.

Administered under the skin, two per cent. solutions of cocaine enable us to perform, without pain, a great number of minor operations. It is with the help of this local anæsthetic that I now practise pleurotomy, and that I secure for the patient exemption from the pain of the first stage of the operation. To attain this result, I inject at both extremities of the line which my bistoury has to traverse a syringeful of a two per cent. solution of hydrochlorate of cocaine.

You may in this way, without pain, open a superficial abscess, or extirpate a lupus; the pain of incising a felon is much mitigated; by the help of cocaine, tracheotomy is robbed of half its terrors; and, in short, you will derive advantage from the local use of this alkaloid in all instances where the incision of the skin is the chief element of pain. In all these cases the local anæsthesia by cocaine is far superior to that produced by cold. Remember that you should always operate with the patient in a recumbent posture, to avoid the vertigo which might ensue, and you should wait ten minutes, at least, after the subcutaneous injection before proceeding to the incision of the skin.

By the aid of cocaine I have operated for phimosis, but if you are not very careful you will have difficulty in approximating the skin and mucous membrane with your *serre-fines* by reason of the artificial œdema produced by the injection of the cocaine solution in the cellular tissue of the prepuce.

I come now to the application of cocaine to the affections of mucuous membranes. I shall omit what pertains to the ocular mucosa, this being the special province of the ophthalmologist, and I shall consider rapidly the benefits derivable from cocaine in affections of the mucous membranes, commencing with the digestive tube.

The buccal and pharyngeal mucous membranes are readily and rapidly anæsthetized by cocaine. In operations on the pharynx, epiglottis, and larynx, generally so painful, you may make applications of this alkaloid, and you have often seen in my service tuberculous patients who could scarcely swallow a mouthful, enabled henceforth to eat by reason of relief from suffering obtained by the repeated use of solutions of this charming local analgesic. You all doubtless remember the case of the late General Grant, and the comfort he obtained the last few months of his life from cocaine.

In the cases of which I have just spoken, the throat is painted with a strong solution of cocaine a few minutes before a meal, and the local anæsthesia lasts about three-quarters of an hour, giving ample time for the repast.

By means of these local applications of cocaine such operations as staphylorraphy are facilitated, and laryngoscopic examinations are rendered comparatively easy, it is also a good plan, in order to avoid the pain of amygdalotomy, either to inject a little cocaine into the tonsil, or, as Lermoyez advises,* to paint the tonsils over several times with a two per cent solution before resorting to the operation. Moreover the painful period in the performance of lavage or "gavage" of the stomach due to the contractions which take place in the isthmus of the fauces, may be obviated by painting with cocaine, and I have been careful to resort to this means whenever patients have experienced difficulty in the introduction of the stomach-tube.

But the anæsthetic action, so local and superficial, of cocaine can be of no service in toothache or in the extraction of teeth; on this point all the best dental surgeons, such as Galeppe and Magitot, are agreed.

Certain diseases of the œsophagus, such as spasmodic stricture, are tributary to the action of cocaine, which may be applied by means of the sound, or by causing solutions to be swallowed.

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*Lermoyez: Anæsthesia by cocaine in Amygdalotomy, Bull. de Thér., t. cviii. p. 108.

As for disorders of the stomach, such as spasmodic affections of this organ with incoercible vomiting, cocaine may sometimes render marked service. Certain perversions of the stomach, and especially boulímia, are also amenable to cocaine, as Beugnier-Corbeau has shown. It is even certain that were cocaine to be bought at a reasonably low price, so that it could be afforded, one might use it to advantage in treating the agonizing pains which attend ulcer and cancer of the stomach, and this might be done by bringing solutions of cocaine directly into contact with the lining membrane of that viscus by means of the syphon tube.

The great benefit which we have derived from the anæsthetizing properties of cocaine in painful affections of the upper part of the digestive tube, has furnished us with indications for its use in certain anal affections. Obissier was one of the first to make application of this remedy in cases of anal fissure.* Before effecting dilatation of the sphincter, he procured complete local anæsthesia by making at two opposite points, just at the margin of the orifice, interstitial injections of two-thirds of a grain of cocaine.

You have seen me have recourse, and successfully, to the same means, and I have been able in the case of one of our patients affected with fissure of the anus,

*Obissier: Note on the employment of Cocaine in Fissure of Anus, Bull. de Thér., t. cviii. p. 10.

[redacted]

to perform forced dilatation without pain by the help of these subcutaneous injections. These injections must be made around the sphincter, and I used in the case at which you were present, four injections of a syringeful of a four per cent. solution. Lotions do not suffice, as the unsuccessful trials of Dr. Clemente Ferreira testify.*

You can also have recourse to cocaine in cases of painful hemorrhoids, and you may here employ suppositories containing one-third of a grain. So much for the mucous membrane of the digestive tube; we will now pass on to that of the genito-urinary organs.

It was in this hospital that one of the first applications of cocaine to the treatment of vaginismus was made. It concerned a patient in the service of our colleague Anger, and who had not been benefited by forced dilatation under chloroform. A few swabbings with a solution of cocaine, made by my interne Lejars, rendered examination easy, and removed all pain and spasm, and thereafter made sexual approaches possible, as the husband of this woman testified some weeks afterward.†

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* Clemente Ferreira: A case of fissure of the anus treated without success by hydrochlorate of cocaine, Bull. de Thér., t. cix. p. 216.

† Dujardin-Beaumetz: A case of vaginismus treated with success by hydrochlorate of cocaine, Bull. de Thér., t. cvii. p. 489.

Almost at the same time Cazin reported to the Society of Surgery a similar case, and since then facts have so multiplied that we may now say that if cocaine does not cure vaginismus, it at any rate greatly alleviates this painful affection in rendering sexual relations possible by the help of inunctions or lotions of this alkaloid.

Gynecology has even gone further, and by subcutaneous injections and swabbings of the neck of the womb, Doleris has maintained that we may to a certain extent mitigate the pains of childbirth.

The urethral mucous membrane is also advantageously modified by the salts of cocaine. I have derived great benefit therefrom in practising cauterization of those painful vegetations which form around the meatus urinarius in females. Guyon has employed cocaine with good effect in the male, to relieve the pain and spasm accompanying catheterism.

Finally, the respiratory and nasal mucous membranes have also derived advantage from this anæsthetic action, when it has been a case of the extraction of polypi from the nose or the application of caustic solutions to the larynx. At the same time, it is necessary to bear in mind the paralyzing action of cocaine; and in a case described by Ayssaguier, grave asphyxiating phenomena were seen to follow painting the larynx with this alkaloid. In fine, to complete the subject, I must tell you that otologists have also utilized cocaine in the treatment of affections of the ear.

To sum up, whenever you desire to obtain an anæsthesia of the skin and mucous membranes which shall be complete, temporary, and of little extent, you may utilize cocaine. Are there other substances capable of producing local anæsthesia of the tissues? This is a question which the future alone can decide. For my part I have tried caffeine, and if it diminishes the sensibility of the conjunctiva, it does this very imperfectly. It has been claimed that menthol has the same effect, but the trials which I have made with this substance have not given me any satisfactory results. Cocaine remains, then, thus far the only local anæsthetic of mucous membranes, and this fact renders the introduction of this alkaloid into medicine one of the most precious therapeutic acquisitions of this age.

Since I have spoken to you of hypnotics, allow me to finish this lecture by announcing the discovery by Dr. Bardet and myself of a powerful hypnotic.

Among the different products of the great aromatic series which we are studying at the present time in their chemical constitution and therapeutic action, is found a mixed acetone having for formula C_6, H_5, CO, CH_3; it is *phenyl-methyl acetone*, or *acetophenone*. This body had been already studied by Popof and Nencki, who observed that this acetone is transformed in the economy into carbonic and benzoic acids, and eliminated by the urine in the state of hippurates.

We have found in this acetone remarkable hypnotic properties; hence we propose to substitute for its compound name the shorter appellation of *hypnone*.

Administered to the adult in the dose of from two to four drops, hypnone causes sleep, and in the insomnia determined by alcoholism its effects seem superior to those of chloral and paraldehyde.

When you inject under the skin of guinea-pigs fifty centigrammes to a gramme of hynone in a state of purity, you determine insensibility, then a comatose state, in which the animal succumbs in the course of five or six hours. Hypnone is, as you see, a body which is liquid at the ordinary temperature, having a very strong odor which resembles that of cherry-laurel and new-mown hay; it is not soluble in water, and therefore we have given it dissolved in glycerine and enclosed in capsules.

Our patients have not experienced any unpleasant effects from it, save always the disagreeable odor of the breath which results from the elimination of the hypnone by the lungs.

What future is in reserve for this hypnotic we do not fully know, but I thought it worth the while, in concluding, to allude to this discovery which results from researches in which most of you have participated.

APPENDIX TO CHAPTER XV.

ABRUS PRECATORIUS.

Jequirity. Synonyms, abri radix (Phar. of Ind.); Indian Licorice, Jamaica wild licorice Liane de Règlisse (Fr.), Liane d Reglisse, Fraginolo Corallino or Semi de Corallo (Ital.), Bejuco peronilla, B. Peonlla (Puerto Rico), Orozuz abro de cuentas or de rosario, or abro de cuentas (Spain); part employed, the seeds; natural order, leguminosæ; habitat, India, South America, Pacific Islands, West Indies, and Tropical Africa.

Preparations.—Parke. Davis & Co. furnish the seeds in packages of one ounce each; and also supply a fluid jequirity in ounce vials. The latter is a concentrated solution of the active constituents of the drug for the extemporaneous preparation of an infusion. One hundred parts of the fluid represent twelve parts of jequirity.

Properties.—Jequirity had for many years been used in Brazil empirically, as a remedy for granulated eyelids, and it came to the knowledge of the illustrious De Wecker of Paris, France, through a patient who had been successfully treated by it.

An infusion is brushed on the inner surface of the lids or applied on a linen compress to the surface of the lids. Thus applied, it will produce in a few days a decided croupous and purulent conjunctivitis, which on subsiding, leaves the trachomatous lids relieved of the granulations. The intensity of the inflammation may be regulated by the frequency and strength of the applications. Applied too frequently, or in too concentrated form, the inflammation becomes diphtheritic in its character. De Wecker's theory of its action is that it develops a vegetable ferment on the diseased conjunctivæ which prevents the evolution of new granulations and is destructive of those already formed.

A cautious trial of jequirity in chronic inflammations of a catarrhal nature of mucous membranes wherever located, has been suggested. Its property of exciting acute inflammation of limited duration would seem to warrant its use in such conditions, *e. g.*, in chronic gonorrhœa, uncomplicated with stricture, vaginal leucorrhœa, etc. An agent which will excite an inflammation which, running its course, will, as it were, smother the original depraved process, has been felt to be a desideratum in such cases. Perhaps jequirity may be found to supply it. A perusal of the articles on the subject reproduced in a pamphlet published by Parke, Davis & Co., will afford a guide to its careful employment.

FORMULA FOR INFUSION OF JEQUIRITY SEEDS.

Pulverize sixteen beans, macerate them in 250 grammes (℥ viij) of cold water during twenty-four hours, then add 250 grammes (℥ viij) of hot water and filter immediately after cooling.

DIRECTIONS FOR USE OF FLUID JEQUIRITY.

Dilute the solution with three to five times its volume of pure water, and apply two drops once a day until the desired effect is produced. It is best to dilute the solution only as it is required for use, as after dilution it quickly spoils. If the action is too severe, employ hot water freely, and very dilute solutions of corrosive sublimate to control it.

DUBOISIA.

Duboisia Myoporides, P. Br. Part employed, the leaves; natural order, Salpiglossidæ, Solanaceæ; habitat, Australia.

Preparations.—Fluid extract of the leaves; dose, 5 to 10 minims (0.3 to 0.6 C. c.).

Solid extract, assayed; dose, ¼ to ½ grain.

Duboisine sulphate; dose, $\frac{1}{100}$ to $\frac{1}{60}$ grain.

Properties.—This drug has been established as an efficient substitute for atropine as a mydriatic, and in the form of the solid extract and of the alkaloid duboisine (identical, it appears, with hyoscyamin), is now largely employed for that purpose in the practice of ophthalmology. The fluid extract has been prepared to meet the demand for a preparation of the drug adapted to internal administration. Its constitutional effects are similar to those of henbane or stramonium, and it may be employed internally for all the purposes of that drug. It has been found useful in relieving night sweats, vesical tenesmus, etc.

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